

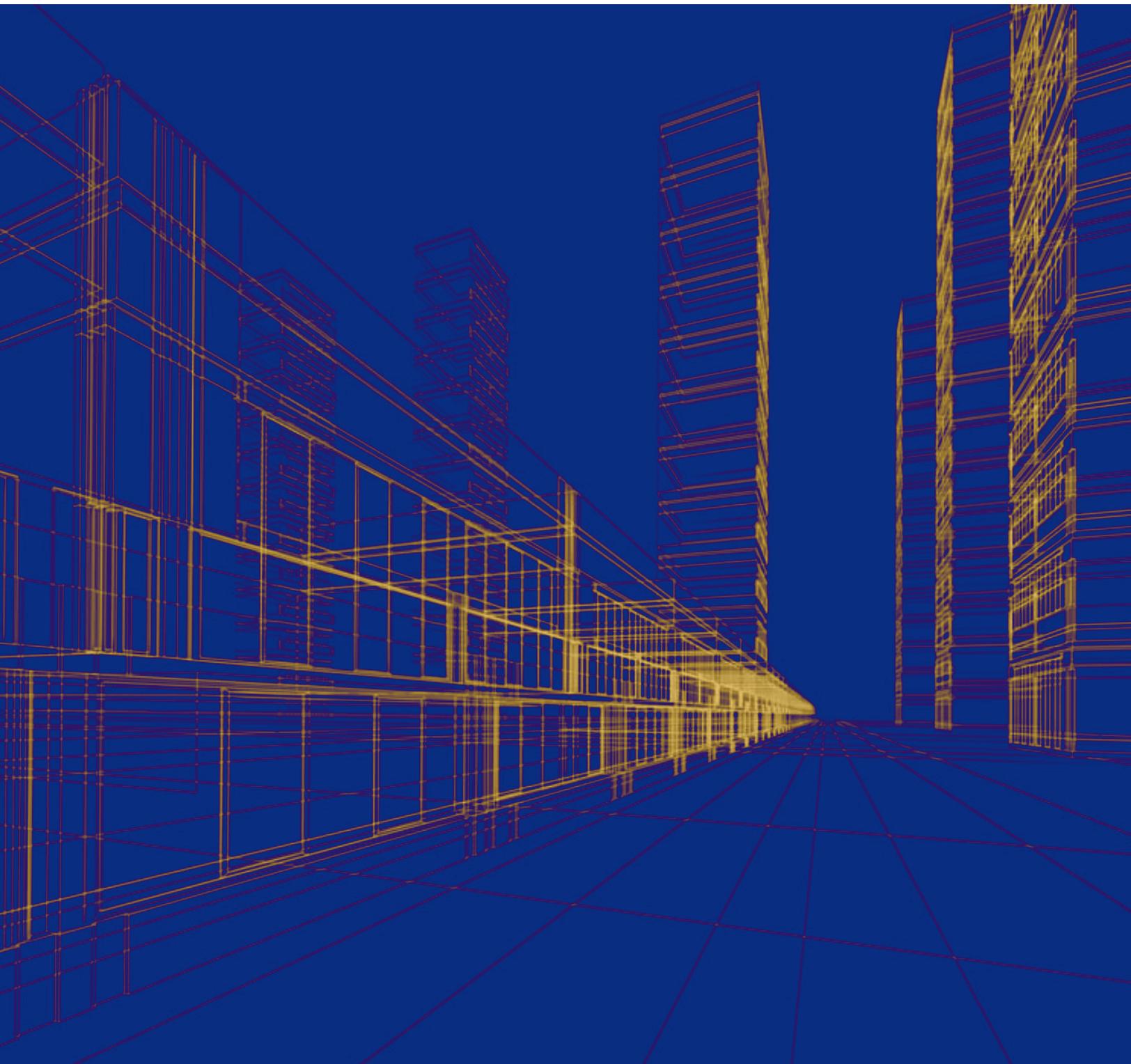


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THE ALTERNATIVE URBAN FUTURES REPORT

URBANISATION & SUSTAINABILITY IN INDIA:
AN INTERDEPENDENT AGENDA



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This Report is part of an initiative by WWF India focusing on “Urbanisation and Sustainability”. Urbanisation in India is organic and as more and more of India urbanises, coupled with economic prosperity and high standards of lifestyles, demand and stress on resources such as water, energy, food, and goods and services as well as infrastructure will intensify, increasing ecological footprint of urban agglomerations. “Urbanisation and Sustainability” initiative aims to provoke a constructive process of dialogue on how the cities of today will be different from cities of tomorrow through a process of innovation and efficient utilisation and management of resources resulting in reduction of urban footprint. This Report, prepared by Mirabilis Advisory, first in the series, focuses on two crucial areas of urbanisation – urban form and density; and public transportation and walkability.

foreword

The future shape of India's cities will determine the viability of its ecological resources and thereby the very future of our rivers, the atmosphere that gives us life and the natural habitats and forests that support India's amazing biodiversity. It is imperative that we urgently employ strategies for urban infrastructure development that are in harmony with our existing 'natural infrastructure'. It is in this context that *'The Alternative Urban Futures Report'* assumes significance.

Interestingly, even though only 30% of India's present population dwells in its cities and towns; it is estimated that urban areas generate over 60% of the country's GDP and account for 90% of the government's tax revenues. These numbers underscore the significance of cities in India's economic and social development; more importantly, they highlight the opportunity cities represent for India in the 21st century.

Conventional thinking about the future of India's urbanisation often focuses on megacities like Mumbai, Delhi or Kolkata. The larger cities dominate the imagination and interests of the public, the media as well as intellectuals. Patterns of growth suggest, however, that most of India's urbanisation will take place in smaller cities and towns with population less than 500,000. This facet of urban growth represents a great challenge; equally it can provide the much needed impetus for innovation in sustainable urban infrastructure development.

We believe the first step towards action is a Vision – that articulates an alternative urban future, or more accurately, *alternative urban futures for India*. This Report is an effort to support our policymakers, practitioners, and future urban managers, to take that very important first step. The unprecedented and unmatched urban growth that we are experiencing today demands a radical and proactive response, for which we need to bring collective wisdom and ideas to imagine a new future. This will necessitate a wide range of policies and practices to be conceptualised around new 'sustainability - oriented' and 'environment-friendly' paradigms.

While India can, and should, draw from a variety of lessons from the world that has already urbanised, it can also base its tomorrow on fresh thinking and original ideas provoked within a local context. What follows is a thoughtful attempt to challenge mindsets and provide practical solutions for our common urban future – a future that can be economically stable, socially equitable, and most importantly, environmentally sustainable.

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contents

Executive Summary	7
Introduction	9
CHAPTER 1	
THE LINK BETWEEN URBANISATION AND SUSTAINABILITY	11
1.1 What is Urbanisation?	12
1.2 Decoding the Link between Urbanisation and Sustainability	13
1.3 Cities as Key to Sustainability	16
CHAPTER 2	
INDIA NOW, INDIA THEN	19
2.1 The Reluctant Urbaniser	20
2.2 India's Urban Future	22
2.3 India's Urban History	24
2.3.1 Mumbai: A Railway City	24
2.3.2 Delhi: A City of Imperial Grandeur... and Roads	26
2.3.3 Kolkata: A City in Three Stages	30
2.4 The Decline of Small Town India	32
2.5 Failure of New Cities in Modern India	34
CHAPTER 3	
ALTERNATIVE URBAN FUTURES: OPTIONS FOR INDIA	37
3.1 Energy	38
3.2 Transport	39
3.2.1 Drivers of Energy Demand with Respect to Transport	40
3.2.2 Energy Consumption in Transport : Paths to 2050	40
3.2.3 Importance of Walkability	44
3.3 Buildings	49
3.3.1 Energy Consumption in Bulidings Sector	49
3.3.2 Energy Consumption by Buildings : Paths to 2050	50
3.4 Waste	53
3.4.1 Transforming Waste to Energy	54
3.5 Water	55
3.5.1 Water Scenario for Delhi in 2050	57

contents

CHAPTER 4	
AN URBAN VISION FOR INDIA	59
4.1 Urban Form & Density	60
4.2 Public Transport & Walkability	63
4.3 The Need for an Integrated but Evolving Framework	64
4.4 The Problem of Municipal Governance	66
4.5 Strategic Interventions Versus Master planning	68
ANNEXURES	70
1 Urban Governance in India	71
2 Brief Overview of Urban Planning in India	76
3 International Collaboration : Bridging the Gap	79
4 Smart Growth and Sprawl	81
5 Analysis of CDPs of 20 Cities vis-a-vis Urban Form and Walkability	82
6 Population Density Charts of Cities	85
7 On Two Legs and a Prayer	86
References	94
Key Informants	99

executive summary

More than half of the world's population is now urbanised but India is still largely a rural country (65-70% of the population still lives in villages). Indeed, it has been a very reluctant urbaniser compared to other Asian countries. However, as economic development shifts increasing numbers away from subsistence agriculture, the country is about to embark on a period of rapid urbanisation. The explosive growth of Gurgaon and Bangalore in the last ten years is only a foretaste of what we are likely to witness in the next few decades. This process will probably make India an urban majority country by 2040. In other words, urban India needs to prepare for the influx of another 350mn people when it is already struggling with the existing population. Such a shift will have a profound impact on the country's economy, society and, most importantly from our perspective, its ecological footprint. This will not just affect India's environmental sustainability but, given the country's size, that of the world.

To the lay person, it may appear that urbanisation is an unmitigated disaster for the environment. International experience suggests, however, that what really matters is the type of cities we build. Take for instance, Barcelona and Atlanta – both former Olympic hosts with populations of around 2.8mn and with roughly the same standard of living. Yet, studies have shown that the per capita ecological footprint of Atlanta is four times that of Barcelona! Indeed, Barcelona's per capita environmental impact is lower than that of many rural areas of Europe. So, how can we ensure that India's future urban trajectory follows Barcelona rather than Atlanta?

In this report we have analysed both international experience as well as the historical development of Indian cities. We found that the "DNA" of a city gets embedded in its urban eco-system in the early stages of development by the choice of urban form and transport system. Changing this DNA retrospectively can be both difficult and expensive. As India is yet to build most of its urban spaces, we have the opportunity to embed the country with an environment-friendly DNA – an urban vision based on sustainable planning paradigms. In this report we have modelled a number of alternative trajectories and strategies (we focused on energy use but we also briefly looked at water and waste). The implications are clear and unambiguous. The following are the three most important findings:

urban form & density

Most of the discussion about urban sustainability in India centres around "green codes" for buildings. A number of "green codes" have been initiated including LEED, GRIHA and so on. Our discussions with leading architects, however, suggests that these codes typically give us energy savings of around 15% in the Indian context (higher savings are possible but they involve sharply higher costs). This is a useful saving but it cannot account for the difference between a Barcelona and an Atlanta.

The problem with so-called green codes is that they exclusively focus on maximising an individual building whereas the real gains come from overall urban form. Our modeling illustrates the large difference in trajectories of energy use depends on the density of urban form. There are many ways in which density helps limit environmental damage – reducing land use, encouraging people to live in apartments, the clustering of civic amenities and public transportation, supporting walkability and so on. In short, the factors that matter are: Is the city dense or sprawled? Do people live in apartments or free-standing houses? Is the city designed for public transport? For instance, energy use drops by over 30% just by moving people from houses to apartments even if we ignore the green codes. Similarly, public transport systems do not work efficiently when the city is spread out and commuters cannot easily walk to the bus/metro stop.

executive summary

If anything, our models are conservative since they have not considered externalities such as how urban expansion is eating into productive farm lands and forests. In other words, we need to give up the flat urban sprawl as a model for urban growth. Note that we are not just arguing large, dense mega-cities. The principle of density works just as well for small towns.

public transport & walkability

Almost all Indian cities suffer serious traffic gridlocks caused by a boom in car ownership. It was once thought that flyovers would solve the problem but experience shows that, at best, these are temporary solutions. Our scenario analysis clearly demonstrates that a shift in modal split in favour of public transport can significantly lower energy use. Public transport systems range from buses to underground railways. However, the simplest and most widely used form of public transport is “walking” (and its sister mode “cycling”). A 2008 study of 30 Indian cities showed that almost 40% of all trips in urban India involved no motorised vehicles at all – 28% walked and 11% cycled. The proportion was sharply higher in smaller towns since distances were usually small and the roads less congested. However, in bigger cities, the proportion of people using conventional public transport was high, and consequently commuters walked the last mile. For instance, in cities with more than 8 million population: 22% walked all the way, 8% used cycles and 44% used public transport. This adds up to 74% of people who rely on non-motorised transport for at least part of the commute.

Walking is a form of transportation that is almost entirely neglected by urban planners in India even though the majority of Indian city-dwellers walk all or part of their journeys. This is unfortunate because it is not just the least ecologically damaging form of transportation but is a critical strategic enabler for other public transport systems to function effectively. Without last-mile walkability, neither buses nor metro-rails would work effectively (note how this fits with the need for dense urban form). Furthermore, it has large positive externalities from social and economic perspectives – it is socially equitable, promotes community/social cohesion, improves health and can give the city a “buzz” factor.

using strategic paradigms

A central problem with implementing any of our recommendations is that urban India suffers from poor governance. Poor governance affects everything from traffic flows to unauthorised construction, transmission losses in power and pilferage of water. Indeed, repeated attempts to enforce master-plans have failed even in the national capital. Governance is usually far worse in the smaller towns. Of course, urban governance needs to improve but we think civic authorities should use a somewhat different strategy to guide the trajectory of urban growth. This would involve identifying a few simple paradigms that encapsulate the broader effort to build economically, socially and environmentally sustainable cities. The government could then use focused strategic interventions to integrate these paradigms into the urban fabric. We feel that density, public transport and, more specifically, “walkability” should be adopted as the central paradigms for future urban thinking in India. This should be done as soon as possible so that the coming urban boom will naturally absorb this new approach.

introduction

We live in an urban age. The world's urban population grew from 220 million to almost 3 billion over the 20th century. By 2050 about 70 percent of the world's population will be urban. With the urban populations of Asia and Africa set to double between 2000 and 2030¹, future urbanisation will largely be a developing world phenomenon². India, expected to be an urban majority country^{3,4}, by 2040-45, will be at the forefront of this massive socio-economic shift. We believe the manner in which the subcontinent responds to urbanisation over the next two decades will define the social, economic and environmental future of not just the country, but also of the world. While the more conventional challenges of urbanising societies of providing adequate housing, public transportation and other civic amenities are recognised, we feel the overall environmental impact of India's urbanisation has not yet been fully understood or studied. As a result, little thought is being given to the different future trajectories available to urbanising India. This view is corroborated by independent research, which confirms that environmental issues (fresh water, pollution, climate change, waste) do not figure very high on the agenda of city planners and local/national development authorities in India⁵.



Brand New Office Complex in Gurgaon

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In 1992, William Rees developed the concept of the 'Ecological Footprint' to assess the reliance of the planet on its natural resources and ecological assets. Ecological footprint is a measure of how much biologically productive land and water an individual, population or activity requires to produce all

¹United Nations Population Fund (UNFPA), 'Unleashing the Potential of Urban Growth', State of World Population Report 2007

²According to United Nations Department of Economic and Social Affairs/Population Division; World Urbanisation Prospects: The 2003 Revision Population Database; In developed countries, 75 per cent of the population already lives in cities, compared to 35 per cent in developing countries. But the rate of urbanisation in those countries is much higher – 3 per cent compared to 0.5 per cent in developed countries. Estimates show that by 2030, about 84 per cent of the population of developing countries will be living in cities.

³United Nations Population Division; World Urbanisation Prospects: The 2007 Revision Population Database

⁴Currently 30 per cent of India's total population, or approximately 330 million people live in urban areas

⁵According to Urban Age, London School of Economics & Political Science (2008), 'Integrated City Making, Governance, Planning and Transport'; Only 12% of the respondents drawn from every level of Indian government and civil society mentioned the environment as one of three key challenges for urban India. The other key challenges included Planning (47%), Transport (41%), Governance (32%), Infrastructure (24%), Migration (18%), Housing (18%), and Inequality (12%).

the resources it consumes, and to absorb the waste it generates using prevailing technology and practices. Ecological Footprint is usually measured in global hectares. At a macro level, India appears to be doing well on this measure with an average per capita ecological footprint of 0.8 global hectares. In comparison, developed countries have an average per capita ecological footprint of 6.43 global hectares⁶. India's relatively small ecological footprint is mainly due to low standards of living in both urban and rural areas. With the economy growing, even a small increase in income levels is likely to lead to an increase in the per capita ecological footprint of India. Furthermore, it must be noted that while the per capita consumption might be low, given the absolute numbers of people who live in India, the total consumption of natural resources is already quite significant. Overall, therefore, the relatively small per capita ecological footprint does not necessarily translate into an environmentally sustainable development trajectory, particularly in the context of urbanisation⁷.

Already, India is the world's fourth largest carbon dioxide (CO₂) emitter with emissions amounting to 1.34 billion tonnes per annum⁸. The top three emitters of CO₂ are China with 6.2 billion tonnes, the US with 6 billion tonnes, and Russia with 1.5 billion tonnes. Even if India holds on to its promise of keeping its per capita emissions lower than that of developed economies, given its current rate of population and economic growth⁹, it will soon outstrip Russia to become the third largest emitter and, if unchecked, will ultimately catch up with the other two. A similar story can be told about the patterns of waste generation and water consumption in India.

The fact that most of these emissions will come from India's growing urban agglomerations¹⁰, make the need to build environmentally sustainable cities an immediate and urgent one. Today, three of India's cities: Delhi, Kolkata and Mumbai figure among the 10 most polluted cities in the world^{11,12}. This dynamic is further underscored by the relationships that exist between urban agglomerations and their rural hinterlands; unplanned growth of cities is likely to have a negative impact on rural environments and livelihoods as well.

So what should be done? In this report, we first decode the link between urbanisation and environmental

[INDIA'S] RELATIVELY SMALL PER CAPITA ECOLOGICAL FOOTPRINT DOES NOT NECESSARILY TRANSLATE INTO AN ENVIRONMENTALLY SUSTAINABLE DEVELOPMENT TRAJECTORY, PARTICULARLY IN THE CONTEXT OF URBANISATION

sustainability by looking at international experience. Next, we look at the historical development of Indian cities and at the future of urbanisation in the country. Thirdly, we model the implications of different urban development trajectories, especially with regards to energy use. Finally, we draw concrete conclusions from the analysis, and make recommendations to achieve sustainable urbanisation in India.

⁶World Wide Fund for Nature (2006), Living Planet Report

⁷Across the world it is cities or the most urbanised regions that generate the greatest proportion of CO₂ emissions. According to D'Monte, D. (2007), 'The Role of Cities in Climate Change', InfoChange News & Features; Three-quarters of the carbon dioxide in the world, which is the biggest greenhouse gas, is emitted by cities.

⁸Fitter, P.M. (2008), 'The Green Trade', Business World, 22 September

⁹The challenges associated with India's pace of urbanisation and population growth have been well recognised across the board. For example, World Economic Forum and the Confederation of Indian Industry, 'India @Risk 2007', explicitly state that the pace of upward mobility, urbanisation and industrialisation pose significant adjustment costs and risks to policymakers.

¹⁰A study by Kumar and Bhattacharya (1999) has shown that between 1975 - 1995, while the economy grew 2.5 times, industrial pollution grew 3.47 times and vehicle pollution 7.5 times. The situation is thought to have worsened since then.

¹¹Megacities' populations and average suspended particulate mass concentrations in µg/m³; Tokyo: population: 35 million, particulates: 43; Mexico City: population: 18.7 million, particulates: 69; New York: population: 18.3 million, particulates: 23; São Paulo: population: 17.9 million, particulates: 46; Mumbai: population: 17.4 million, particulates: 79; Delhi: population: 14.1 million; particulates: 187; Kolkata: population: 13.8 million, particulates: 153; Buenos Aires: population: 13 million, particulates: no data; Shanghai: population 12.8 million, particulates: 87; Jakarta: population: 12.3 million, particulates: 103 (Source: <http://planetearth.nerc.ac.uk/features/story.aspx?id=148>)

¹²According to United Nations Environment Programme (2008); New Delhi, Kolkata and Mumbai feature in the list of 13 megacities where Atmospheric Brown Clouds are reducing the sunlight hitting the Earth's surface making the cities "darker or dimmer."

chapter 1

the link between urbanisation and
sustainability



1.1 what is urbanisation?

In India, like elsewhere, “urbanisation is the sociological and spatial counterpart to economic processes that shift workers away from subsistence agriculture to more productive sectors. It is the physical manifestation of all the construction activity that accompanies rapid growth¹³.”

Figure 1 below illustrates both the drivers and impediments to urbanisation. A shift from subsistence agriculture is primarily driven by an increase in educational and aspiration levels, growth of agricultural productivity, focused and deliberate government policy and growth of non-farm activity. On the other hand the factors that prevent the shift from subsistence agriculture to other economic activities and thus impede the process of urbanisation include: poor civic infrastructure, lack of focussed and deliberate government policy, a planning bias towards metropolitan centres of growth, the decay of small towns and the slow rate of industrialisation.

India has a history of urbanisation since ancient times. The most well known examples are of the city-settlements of Harappa and Mohenjo-Daro which date back to the Indus Valley civilisation of 3000-1700 BC. Archaeological evidence reveals the high level of urban planning that existed in

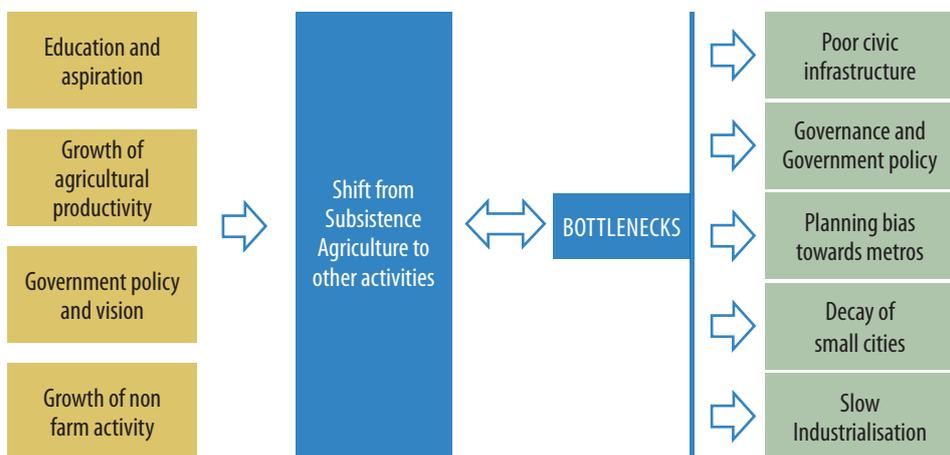


Figure 1: Factors (Drivers and Impediments) Influencing Urbanisation

Source: MAPL Analysis

the cities of the Indus Valley. The settlements had clearly demarcated public and private areas, streets laid out in grids, as well as an extensive and sophisticated system of drainage and waste removal. These are arguably the earliest “planned” urban settlements in the world.

Cities and urban areas have since set the foundation of modern civilisation – they have proved to be the engines of economic growth, and the centres of innovation, culture, knowledge and political power. This report defines sustainable urbanisation as a process by which urban settlements contribute to environmental sustainability in the long term. Such urbanisation would require conservation of non-renewable resources, mass-scale deployment of renewable resources, and a reduction in the energy-use and waste-production per unit of output/consumption. Moreover, the pattern of urban growth should facilitate a fair distribution of resources, both within the present generation and between present and future generations. Finally, we need to be aware at all times that environmentally sustainable cities must also be vibrant economic and social agglomerations – environmental sustainability is meaningless in an economic/social wasteland.

¹³Sanyal, S. (2008), ‘The Indian Renaissance: India’s Rise After a Thousand Years of Decline’, Penguin (India)

1.2 decoding the link between urbanisation and sustainability

Economic development is closely linked to urbanisation. As people move from subsistence farming to other activities, we invariably see some form of urbanisation. Cities are hubs of production, consumption, and waste generation. As cities grow, so does their ecological footprint; they consume more and more natural resources to meet the rising demand for food, water, energy, and goods and services.

The industrialisation of Asia has led to a large increase in its use of energy. For instance, in 1990, emerging Asia energy accounted for 15 per cent of total world consumption – this figure rose to 22 per cent in 2002 and is projected to increase to 31 per cent by 2025¹⁴. Much of this energy comes from non-renewable sources such as coal, oil and natural gas. Asia's rapidly growing cities are the hubs of the boom in economic activity and, consequently, are the source of the growth energy use, waste generation



Construction Site, Gurgaon

© Verma, A.

and pollution. Sewage disposal from cities is an important source of pollution in lakes and in coastal sea areas. Yet proper treatment of sewage is extremely inadequate in most cities in the developing world. Another rapidly emerging problem is access to water. It is estimated that the number of people impacted by water scarcity could rise from 1.7 billion today to 5 billion by 2025¹⁵.

As discussed earlier, India's average per capita ecological footprint of India¹⁶ is 0.8 global hectares¹⁷. This figure is very low when compared to the global average, which is 2.2 global hectares, or to that of most developed countries which average an ecological footprint of 6.43 global hectares¹⁸. Figure 2 below compares India's ecological footprint with that of Spain, United Kingdom and the United States of America which have an ecological footprint of 5.40 global hectares, 5.60 global hectares and

9.60 hectares respectively. The figure also compares the ecological footprint of different cities.

We can draw two interesting conclusions from this data. First, cities with roughly comparable standards of living can have very different ecological footprints – with Barcelona and Vancouver on one hand and

¹⁴International Energy Outlook (July 2005), Energy Information Administration (EIA), Table 1, 'World Marketed Energy Consumption by Region, 1990-2025'

¹⁵Roberts, B. and Kanaly, T. (2005), 'Urbanisation and Sustainability in Asia', Water Resource Institute, 2005

¹⁶City-wise ecological footprint is not available for Indian cities

¹⁷World Wide Fund for Nature (2006), Living Planet Report

¹⁸Ibid.

urbanisation and sustainability

Atlanta and Dubai on the other. For instance, the per capita footprint for Barcelona is 3.26 global hectares, London 6.63 global hectares and Atlanta 13 global hectares. Note that the link between standard of living and ecological footprint is not linear. Indeed, one could argue that Barcelona provides a higher standard of living than Atlanta but at a fourth of the environmental cost. Second, cities can have ecological footprints that vary greatly from the national average. Some cities do far worse while others do far better than the national average. The message is clear – the way the city is made i.e. the urban form of the city matters.

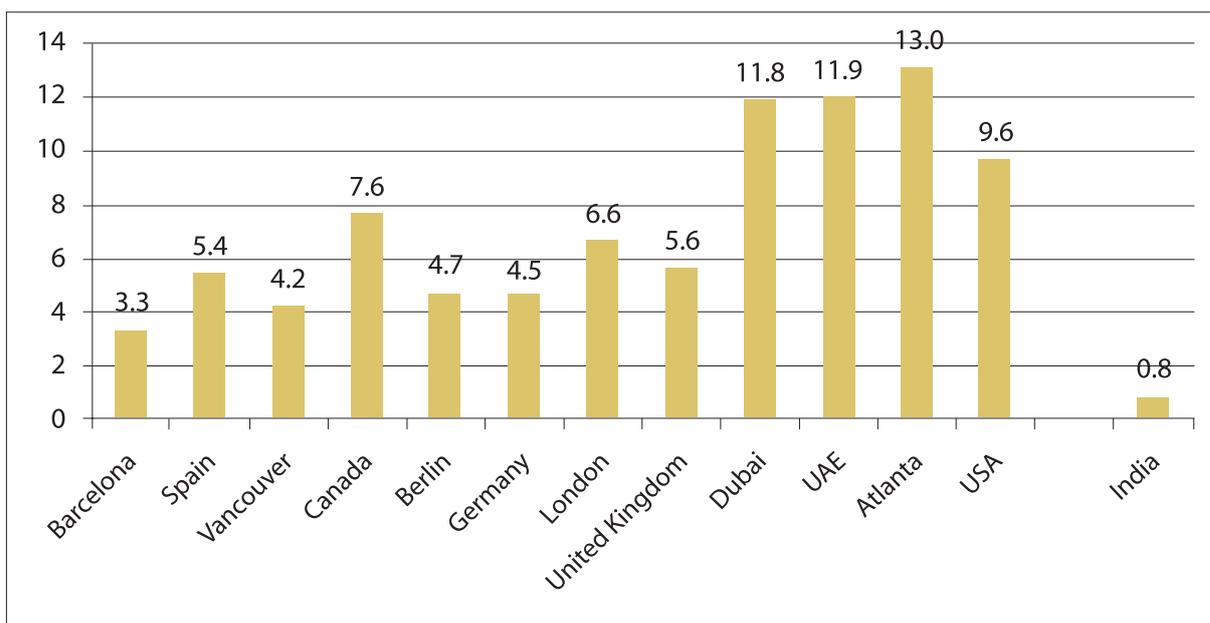


Figure 2: Comparative Ecological Footprint of Cities and Countries

Source: MAPL Analysis¹⁹

Unfortunately, no data is available on the ecological footprint of Indian cities. Our sense is that Mumbai would have an even lower ecological footprint than the national average. However, this is not a matter of pride because it is achieved by making significant compromises on the standard of living. 50-60 percent of Mumbai's population currently resides in accommodation that is not fit for purpose²⁰. The city's suburban railway system, originally designed for a capacity of 1,700 people per 9-car train, runs with super-dense capacities of almost 5,000 people per train during peak time.

In short, the low ecological footprint for India has been achieved by extreme compromises on quality of life. Any increase in prosperity will lead to an increase in this footprint. This is bound to impact the environment significantly. For instance, the urbanisation process dramatically affects energy consumption. A 2003 analysis from the World Bank showed that an increase of 1 per cent in urban population increases energy consumption by 2.2 per cent²¹. The Energy and Climate Change Report of the World Business Council for Sustainable Development (2007) estimates that with population growth worldwide, increasing development needs and rising standards of living, global energy

¹⁹Barcelona: Clos, J. (2002); Barcelona Metropolis Mediterranean, 'Agenda 21 - A Question of Balance' Canada, Germany, Spain, India, UAE, United Kingdom, USA: Footprint Network, Ecological Footprint and Biocapacity (2006 Edition); Vancouver: Richardson, H.W. & Gordon, P., University of Southern California, 'Sustainable Portland? A Critique, and the Los Angeles Counterpoint' (October 2001); Berlin: Urban Environmental Management, The Ecological Footprint of Berlin; London: Best Foot Forward; City Limits London: A Resource Flow and Ecological Footprint Analysis of Greater London' (September 2002); Dubai: World Wide Fund for Nature, Major Environmental Threats in the UAE (http://www.panda.org/who_we_are/wwf_offices/unity_arab_emirates/about/threats/); Atlanta: Head, P., ARUP, 'Entering the Ecological Age: The Engineer's Role', The Institution of Civil Engineers, Brunel International Lectures (2008), pg. 43

²⁰Urban Age, London School of Economics & Political Science (2008), 'Integrated City Making, Governance, Planning and Transport'

²¹World Business Council for Sustainable Development (July 2008), 'Energy Efficiency in Buildings, Business Realities and Opportunities'



Rush Hour in a Mumbai Local Train

© Nagrath S.

demands are estimated to rise by two to three fold by 2050. In per capita terms, as GDP per capita rises past USD 3,000 (in PPP), energy demand explodes as industrialisation and personal mobility takes off. From USD 15,000, demand grows more slowly as the main burst of industrialisation is complete and services begin to dominate. Beyond USD 25,000, economic growth can continue without significant energy increase²². According to the World Development Indicators, India's current GDP per capita in PPP is approximately USD 4,000. This implies that the country is only just beginning to enter into the initial stage of rapidly increasing energy demands. Therefore, it is very important India thinks hard about how to avoid the "Atlanta" path and to emulate the "Barcelona" option.

...THE URBANISATION PROCESS DRAMATICALLY AFFECTS ENERGY CONSUMPTION... INCREASING DEVELOPMENT NEEDS AND RISING STANDARDS OF LIVING, GLOBAL ENERGY DEMANDS ARE ESTIMATED TO RISE BY TWO TO THREE FOLD BY 2050... [INDIA] IS ONLY JUST BEGINNING TO ENTER INTO THE INITIAL STAGE OF RAPIDLY INCREASING ENERGY DEMANDS

²²World Business Council for Sustainable Development (December 2005), 'Facts and Trends to 2050, Energy and Climate Change'

1.3 cities as key to sustainability

So, is urbanisation an environmentally bad phenomenon and should it be discouraged? We view this question at two levels.

First, we feel that it is an inevitable part of development and is the spatial mirror of the shift away from subsistence farming. The living standard of the average Indian is currently untenable and we should expect some form of urbanisation in the next several decades. Discouraging it may not be politically, economically or morally possible.

Second, and more importantly, the ecological cost of delivering a high standard of living to a rural inhabitant can be very high. Two case studies of rural areas indicate that their ecological footprints are on par or higher than footprints of certain cities. Rutland, a village in England, has an ecological footprint of 5.49²³ global hectares per person. Doon village in Ireland has an equally high ecological footprint of 4.5²⁴ global hectares per person. These are far higher than a city like Barcelona or Vancouver.

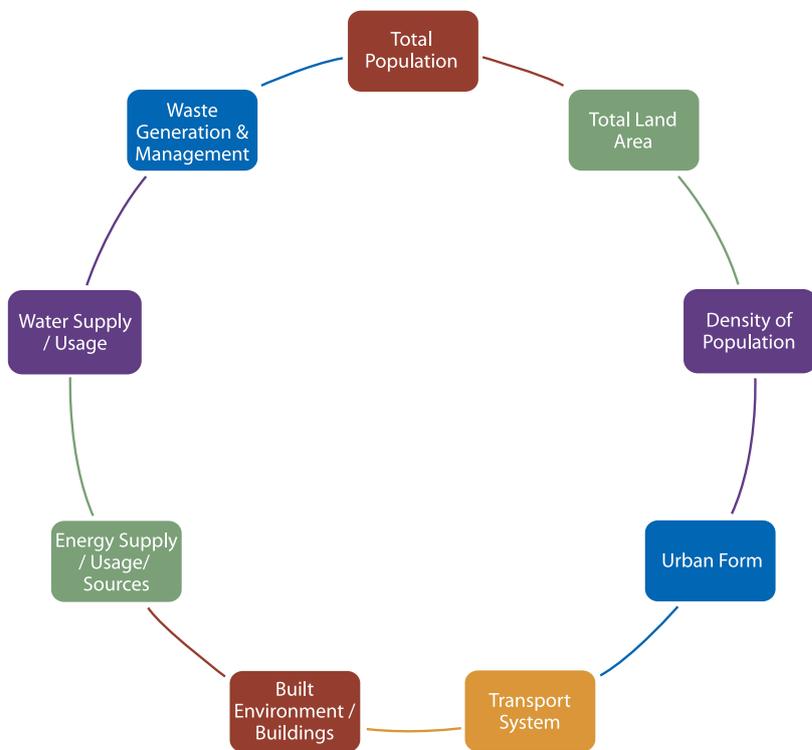


Figure 3: Factors that Determine the Ecological Footprint of any Country/City

Source: MAPL Analysis

Clearly, stemming the process of urbanisation, putting strict controls on migration and running to villages is not the solution to achieving environmental sustainability. Far better, we recognise that urban form is the crucial factor determining the ecological footprint of a city-dweller. As seen in Figure 2, a city can, despite having a relatively high standard of living, have a comparatively low ecological footprint.

A city's ecological footprint depends on a number of factors as seen in Figure 3. To determine alternate development trajectories for India's cities, we make a comparative assessment of

the ecological footprint of six cities from across the world: Atlanta (USA), Dubai (UAE), London (UK), Berlin (Germany), Vancouver (Canada) and Barcelona (Spain). This can be seen in Figure 4, which is a graphical representation of what the total ecological footprint of urban India would look like by 2050, if its growth trajectory follows any of the six urban development models characteristic of each of the different cities.

²³Stockholm Environment Institute (resource-accounting.org.uk/downloads/uk.xls)

²⁴Ryan, B., 'Ecological Footprint Analysis: An Irish Rural Study', Dublin Institute of Technology

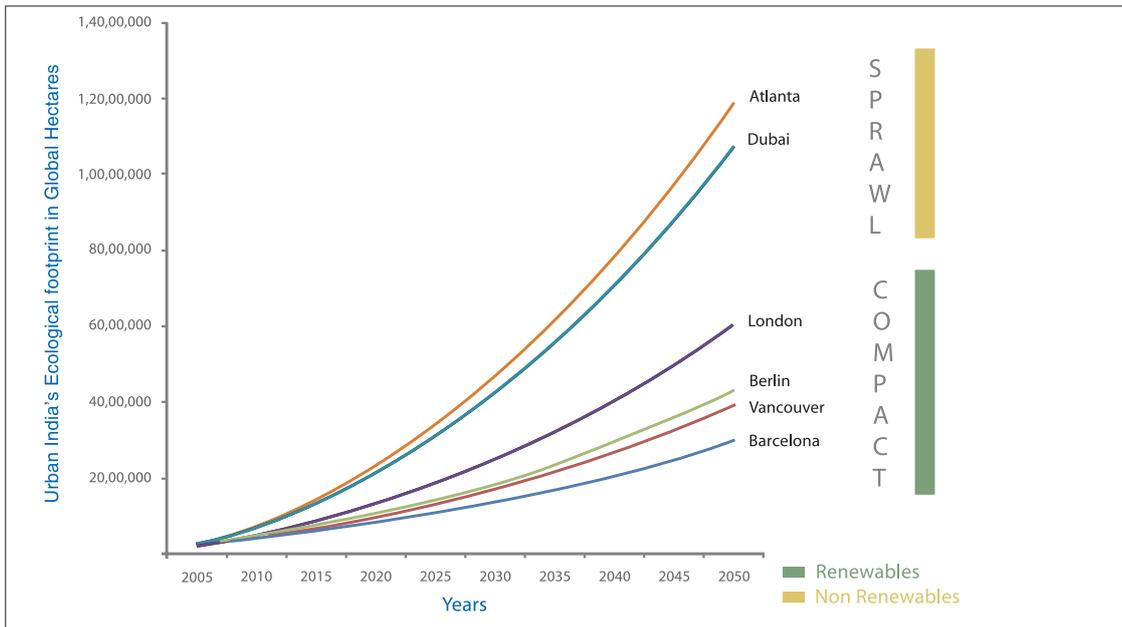


Figure 4: Alternative Urban Futures for India

Source: MAPL Analysis²⁵

Figure 5 shows how the ecological footprint of the cities is determined by urban form. Atlanta, with a per capita ecological footprint of 13 global hectares, has an urban form which is sprawled. The population boom that took place between 1970-1990 resulted in the city's expansion wherein urbanisation swallowed acres adjacent to the main city. The city's public transport system, though cheap, is rather inconvenient and more than 90 per cent of the city's population relies on private vehicles to get around.

CITIES / PARAMETERS	PER CAPITA ECOLOGICAL FOOTPRINT	POPULATION DENSITY (PEOPLE PER SQ KM)	URBAN FORM
Atlanta	13	700	Sprawl
Dubai	11.8	2650	Sprawl
London	6.6	5100	Compact
Berlin	4.7	3750	Compact
Vancouver	4.2	1650	Sprawl
Barcelona	3.2	4850	Compact

Figure 5: Comparative Analysis of Cities' Ecological Footprint

Source: www.citymayors.com²⁶

On the other end of the spectrum are the cities of Barcelona, Vancouver and Berlin which have much lower per capita ecological footprints at 3.2, 4.2 and 4.7 global hectares respectively²⁷. The three cities have achieved this through moving towards a denser/more compact urban form, an extensive and efficient public transport system and more recently a shift towards using renewable sources of energy.

²⁵Increase in Urban Population: United Nations Population Division, World Urbanisation Prospects: The 2007 Revision Population Database; Ecological Footprint: See Figure 3

²⁶For Per capita ecological footprint see Figure 2, Population Density (People per sq Km): City Mayors Statistics (January 2007), 'The Largest Cities in the World by Land Area, Population and Density

²⁷See Figure 2

cities as key to sustainability

Barcelona had traditionally been a compact and well planned city, with most important locations falling within a small radius. 56 per cent of trips in the city are done on foot. The city has encouraged the development of a strong pedestrian culture²⁸.

Berlin too has a compact urban form, with inner city districts dominated by heavily built up residential areas. While Vancouver has a more sprawled urban form, most commercial buildings are located in the city core. The city authorities have, since 1996, consistently worked at reducing the total number of vehicle trips and have succeeded in achieving a 10 per cent reduction²⁹.

As illustrated by Figure 5, the ecological footprint of a city is impacted by the population density of a city. Atlanta with a population density of 700 persons per square kilometre has a much higher ecological footprint than Barcelona, Berlin and Vancouver which have population densities of 4850, 3750 and 1650 respectively³⁰.

Of course, one cannot view this as a mechanical formula. In the case of London, a compact urban form still results in a relatively high ecological footprint of 6.6 global hectares; the city has identified transport reform as a means of reducing its ecological footprint. Over the past six years it has become the only major city in the world to achieve a palpable shift away from private car usage to public transport and a more recent study will probably show an improvement.

In short, cities can provide a number of opportunities for improved sustainability:

- Higher densities within urban settlements drag down the costs per household for the provision of various sorts of infrastructure – transport, piped water, sewers, power, and allows the possibility of near-universal provision.
- Higher concentrations of populations also provide more potential for recycling – water and waste.
- Larger and yet more compact cities allow the provision of better public transport infrastructures, which has a direct impact on the environment through reduced emissions and fuel-use.



Singapore's Master Plan for 2020

© Nagrath, S.

Urban settlements, if planned to maximise density, provide an excellent opportunity to exploit vast economies of scale for the provision of infrastructure, resources and services. It is not far-fetched to say that cities hold the key to the age of sustainability. Sustainable cities allow their citizens to live within their fair share of the earth's resources without giving up on an urban lifestyle. It must be remembered that a "green" city must still be a socially and economically vibrant city. This requires careful balancing – much can be learned from cities like Singapore which have taken great pains to try and integrate all the various elements.

²⁸Clos, J. (2002), 'Agenda 21 – A Question of Balance', Barcelona Metropolis Mediterrania

²⁹City of Vancouver, Engineering Services (2007), 'Transportation Plan Update'

³⁰See Figure 5

chapter 2

india now, india then



2.1 the reluctant urbaniser

Since the Industrial Revolution, the world has seen steady urbanisation. Western Europe and North America went through this process in the nineteenth and early twentieth century. However, the urbanisation of Asia in the second half of the twentieth century has been extraordinary in both speed and scale. Take the case of South Korea. Once known as one of the world's poorest agrarian societies, the country set out on a deliberate track of economic development in 1962. In less than four decades, Korea emerged as the world's 11th largest economy in terms of GDP³¹. During this period, the proportion of its urban population has increased four-fold from 21 per cent in 1950 to approximately 81 per cent today. The population of Seoul alone increased from about 8 per cent of the total population of the country to 25 per cent in the same period.

In contrast, India is still predominantly rural and has been a reluctant urbaniser so far. As shown in Figure 6, the proportion of India's urban population increased by a mere 12 percentage points from 17 per cent of the total population in 1950 to 28.7 per cent of the total population in 2005. It is expected to increase marginally to 30.1 per cent by 2010. Meanwhile, China has witnessed explosive urbanisation in the last twenty years. China's urban population was barely 13 per cent in 1950 and was lower than India's ratio till the mid eighties. However, this rose to over 40 per cent of the total population in the year 2005³². Some estimates suggest that it is now an urban majority country (although the process may have stalled temporarily in 2009 with the economic crisis).

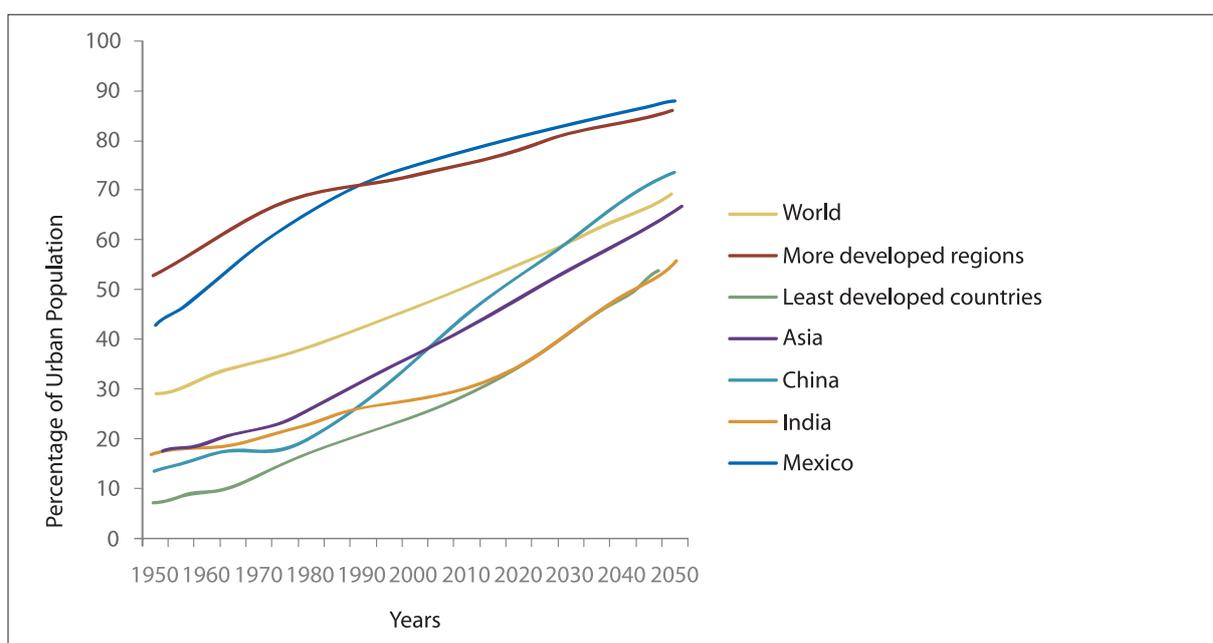


Figure 6: Worldwide Urban Development

Source: United Nations Population Division³³

The cause of India's slow urbanisation is not well studied. In our view, it probably could be ascribed to the general nature of India's post independence socialist development model with its emphasis on import-substitution via capital-intensive industrialisation. Primary education, labour-intensive export industries and the services sector were all deliberately ignored. All these factors may have discouraged the shift of the work-force away from subsistence farming. There was probably also an

³¹The Economic Times (October 2008), 'The Miracle Economy'

³²Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, 'World Population Prospects: The 2007 Revision'

³³United Nations Population Division, World Urbanisation Prospects: The 2007 Revision Population Database

embedded anti-urban bias as the socialist-era policymakers created and sustained the myth that “real” India was to be found in the country’s villages. It was this attitude that guided the earliest policies (or lack of) with respect to urbanisation. Even today, it is viewed by many as a problem that should neither be encouraged nor investigated³⁴. As a result, urbanisation in India has happened in a most haphazard way. In Delhi, for instance, many villages have ended up being marooned in the urban sprawl but without adequate development of urban amenities.



Village now Encircled by Delhi

© Verma, A.

Independent research³⁵ reveals the presence of a strong “rural bias” among India’s politicians as planners “continue to limit government support for urban development.” The research argues that the Indian Government allocates its urban citizens only 1/6th of the per capita spending allocated for rural citizens. The ratio is even more lop-sided when we consider spending on the urban poor which is 1/10th that on the rural poor. An overview of India’s five year plans³⁶ reinforces the pervasiveness of this attitude (See Annexure 2) which has also prevented the upgradation of urban infrastructure in Indian cities post independence³⁷. This rural bias underscores the failure to create a comprehensive urban policy which encompasses issues such as migration and an urban agglomeration’s relationship with its rural heartland.

There has been some revival of interest in cities in recent years but, as we will discuss later, it is limited exclusively to the very largest cities of Delhi, Mumbai, Bangalore, and so on. The small “*moufassil*” towns continue to be ignored. This bias is unfortunate since the smaller towns will provide the backbone of future urban growth in India. We feel this skewed approach must change because of the long-term impact of the decisions taken today. Good city-making ensures long lasting legacies and in many cases hardwires the DNA of the cities permanently. For instance, the Central Business Districts of Mumbai (Fort) and New Delhi (Rajiv Chowk; earlier Connaught Place) still clearly illustrate the vibrant street culture of the past. Poor planning and ineffective governance have led to the sustained decay of the old cities inherited by independent India and the construction of new but unworkable cities like Haldia and Navi Mumbai.

³⁴Sanyal, S., (June 2008 a)

³⁵Urban Age, London School of Economics & Political Science (2008), ‘Integrated City Making, Governance, Planning and Transport’

³⁶Srivastava, R. (January 2005), ‘History of India’s Urban Plans’, InfoChange News and Features

³⁷Urban Age, London School of Economics & Political Science (2008), ‘Integrated City Making, Governance, Planning and Transport’

2.2 india's urban future

In 1991, India embarked on an economic reform programme that has dramatically transformed the economy. The old socialist emphasis on heavy capital-intensive industry was abandoned in favour of a more open and varied economy. This process of reform continues sporadically to this day. As a result, India has emerged as the world's second fastest growing economy (after China) in the first decade of the twenty-first century. Despite the slowdown caused by the global crisis of 2008-09, it is expected to maintain growth rates far in excess of the socialist era. Many factors should help maintain economic growth. The country is witnessing important socio-economic changes such as the spread of primary literacy³⁸. By 2020, primary literacy in India will rise to 90% (compared to 51% in 1991). The country is also going through a major demographic shift that will allow India to bypass China as having the world's largest workforce by the 2020s.

Not surprisingly, many forecasters predict that India's urbanisation will accelerate in tandem with increasing GDP. After all, most of the growth will come from moving the labour force from farming to non-farm activities. The World Urbanisation Prospects (2007 Revision) published by the UN expects 197 million Indians to move to urban areas between 2007 and 2025. Some economists feel that

INDIA'S CITIES NEED TO PREPARE FOR THE
INFLUX OF TENS OF MILLIONS OF PEOPLE
AT A PACE UNPRECEDENTED IN HISTORY...
BY 2025 THERE WILL BE MORE THAN 13
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10 MILLION PEOPLE

this could accelerate even faster in the 2020s. In turn, this would probably result in a majority urban population by 2040³⁹. As we have seen, this will merely follow the experience of the rest of Asia.

As Figures 7 and 8 indicate, India's cities need to prepare for the influx of tens of millions of people at a pace unprecedented in history. According to estimates, by 2025 there will be more than 13 urban agglomerations of more than 10 million people⁴⁰. As stated earlier, the urban agglomerations around

Mumbai and Delhi were already at 19 million and 15.9 million in 2007 respectively. UN projections suggest that by 2025, Mumbai will have 26.4 million people and Delhi 22.5 million, making them the second and third largest urban agglomerations in the world respectively (Tokyo will remain the largest with 36.4 million).

Figures 7 and 8 also show the changing proportion of urban to rural population in India from 1960 until 2050. Today, although only 30 per cent of the country's total population resides in urban areas, it contributes over 60 per cent of the country's total GDP and accounts for nearly 90 per cent of the government's total tax revenues.

³⁸Sanyal, S. (2008b)

³⁹Sanyal, S (2008 c)

⁴⁰World Economic Forum and Confederation of Indian Industry, 'India @ Risk 2007'

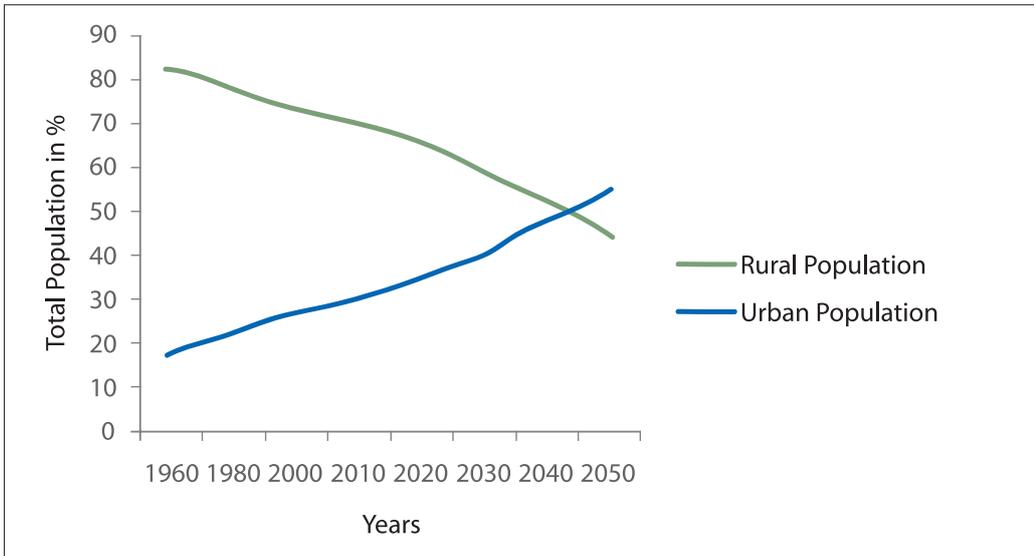


Figure 7: Changing Proportion Of Rural And Urban Populations in India

Source: United Nations Population Division⁴¹

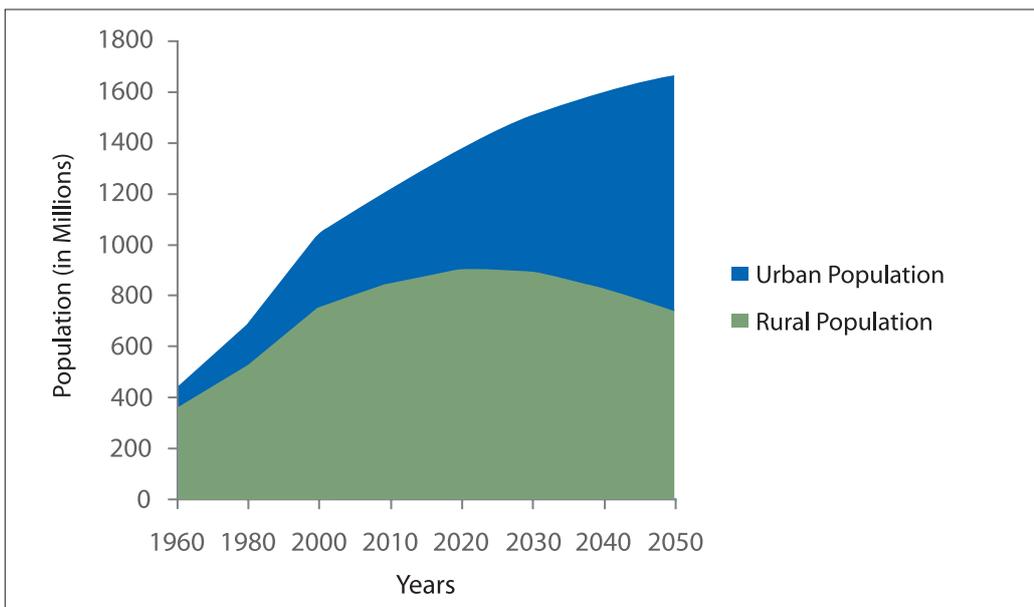


Figure 8: Urban Versus Rural Populations in India

Source: United Nations Population Division

Given the above expectation of accelerated urbanisation, it is important that India prepares to adjust to the implications of this phenomenon and tries to guide it. At present, the governance mechanism for planning and implementation of urban policy in India is weak (see Annexure 1). Cities and towns lack the resources, the skill sets and the technical expertise to cope with rapid urbanisation. On the other hand, since India is in an early phase of urban growth, it presents an opportunity to direct its future trajectory.

⁴¹United Nations Population Division, World Urbanisation Prospects: The 2007 Revision Population Database

2.3 india's urban history

Cities tend to get hardwired by their history. As noted in the previous chapter, the urban form of a city, its transportation system and patterns of energy use are key factors in determining a city's ecological footprint. The way many of today's cities look is based on how they have developed historically, particularly that of the underlying transport system. According to Urban Age, London School of Economics' think tank on urbanisation issues: "Infrastructure development for mass transit, whether metro, trains or buses as well as for private vehicles has had an enormous impact on the patterns of urban growth, shaping land use, densities and the residential distribution of different social groups." Thus, we now turn to the historical development of three of India's largest cities, especially keeping in mind the impact of evolving transport systems.

2.3.1 mumbai: a railway city

As shown in the eighteenth century map below, Mumbai (till recently called Bombay) was once a city of many small islands. It was used as a trading port first by the Portuguese and later by the English East India Company. It grew as the British consolidated their power-base in India but it was initially less important than either Calcutta (today's Kolkata) or Madras (Chennai). However, in the second half of the nineteenth century, it went through a big expansion due to the "Cotton Boom" and the



Mumbai circa 1720

(Courtesy: Sanyal, S.)

opening of the Suez Canal in 1869. Over time, land reclamations connected the small islands and consolidated them into one large island. Meanwhile, the railways were introduced. The first track in India was laid by the Great Indian Peninsular (GIP) Railway Company between Thane and Bombay; it was inaugurated on April 16, 1853. The early introduction of the two major railway lines – the Western and the Central Lines, continues to define the urban form and the character of the city to this day. The first trams were introduced in Mumbai in 1874 and ran between the localities of Parel and Colaba (the trams were later discontinued). Buses made their first appearance in July of 1926. In 1947, there were 242 buses in operation on 23 routes and carried 238,000 passengers per day. Today there are 3380 buses that transport 4.5 million passengers daily on 335 routes⁴². All this has heavily influenced Mumbai's DNA, ranging from its extremely dense urban form to its relatively egalitarian culture (despite large income disparities). To this day, urban growth into the suburbs has tended to cluster around train stations along the Western, Central and Harbor lines.

⁴²The Brihan Mumbai Electric Supply and Transport Undertaking

2.3.2 delhi: a city of imperial grandeur... and roads

Delhi is an ancient city and has served as an imperial capital under many dynasties. Parts of the present city have been rebuilt many times by various rulers. The above map shows Delhi in 1857, when it was still in the form of the “walled city” of Shahjahanabad – built by Mughal Emperor Shah Jahan in the seventeenth century. While the city was built from a defence perspective, display of Mughal grandeur was also a major motivation for its urban design. The centerpiece of the city was the imposing Red Fort which enclosed the palace complex. Shahjahanabad went into decline after it was sacked by the British after the Revolt of 1857 and the last Mughal Emperor was sent into exile in Burma. Political and economic power had already shifted to Calcutta.

In the early twentieth century, the colonial government decided to shift the capital back from Calcutta to Delhi. Under the guidance of architect Lutyens’ New Delhi was commissioned to be built to the south of the existing walled city. The core of Lutyens’ Delhi was built between 1911 and 1931 and was an unabashed display of Imperial grandeur. The centerpiece was the Viceroy’s palace complex (now the Presidential Palace or Rashtrapati Bhavan). Grand boulevards led to imposing government buildings and to the bungalows for senior officials. Given the then recent invention of the automobile, roads were made wide and the city was deliberately spread out.



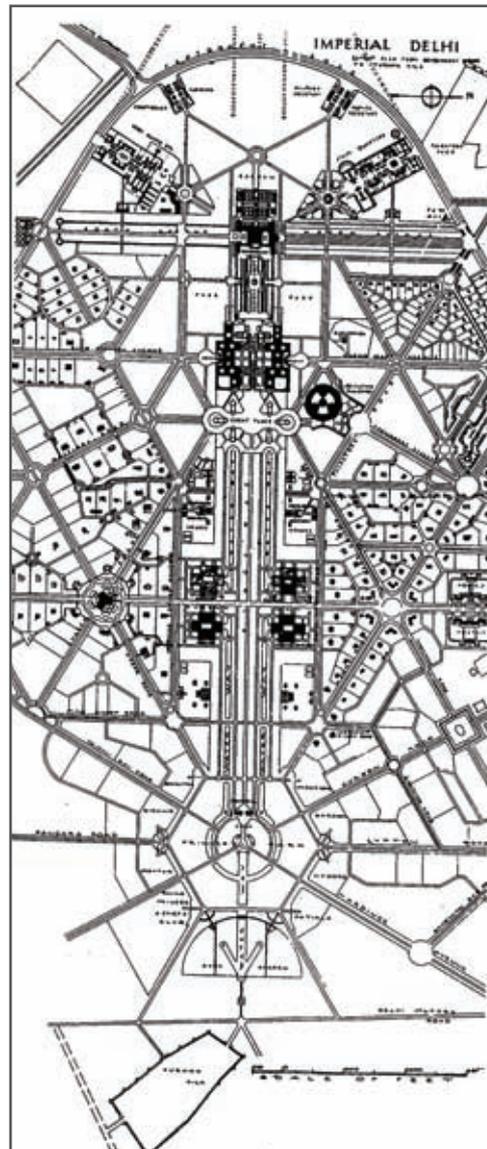
Delhi circa 1857

(Courtesy: Sanyal, S.)

It was this city that became the capital of independent India in 1947. Unlike in Mumbai, rail transport was not given much importance in the initial structural development of Delhi. The use of the automobile got embedded in the DNA of Delhi and subsequent expansions were almost always envisaged with road transport in mind. As recently as the late nineties, satellite cities of Gurgaon and Noida were built with only automobiles in mind.

The emphasis on roads has translated into Delhi having the highest level of car ownership in India; public transport, too, is dominated by buses. According to the Delhi Economic Survey 2007-2008, there has been an exponential growth in the number of vehicles, which increased from 2.848 million in 1996-97 to 5.232 million in 2006-07 at an annual compound growth rate of 6.06 percent. This does not include the number of cars in the wider metropolitan area. The survey also quotes the Society of India Automobile Manufacturers to state that Delhi has 85 private cars per 1000 individuals putting the car density in Delhi at 10 times the national average. It notes that the share of buses (which until 2003 catered to 60 per cent of the city's total transport load) in total number of vehicles has been going down steadily since 2003⁴⁶.

THE EMPHASIS ON ROADS
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Original Plan of Lutyens' Delhi

Source: Byron, R., *New Delhi, New Capital of India*, Asian Educational Services, Reprint of *The Architectural Review*, London

⁴⁶Economic Survey of Delhi, 2007-2008, pp 139 ⁴⁹Vijju, B. and Tembhekar, C. (2009), 'Bandra-Worli Sealink, Still a Dream Drive?', *The Times of India*, 16 February

delhi: a city of imperial grandeur... and roads



National Highway 8 that Connects Delhi to Gurgaon

© Verma, A.

It is interesting that the embedded DNA of a city can sometimes over-rule attempts to change. Take for instance, the failure of the Delhi Ring Railway, a part of the Delhi Suburban Railway services. Conceived during the 1982 Asian Games, the Ring Railway failed because of lack of proper connectivity of stations to other modes transport and less population density in areas of reach⁴⁷. The Ring Rail is now largely defunct.

Nonetheless, things are changing. In recent years, the Delhi Metro Rail Corporation (DMRC) has been trying to radically alter this dependency on road transport and attempting to hardwire the city differently (See Box “Delhi Metro Rail Corporation”). The attempt appears to be succeeding in parts of the city – especially in the dense ring of urban development than now surrounds Lutyen’s Delhi. In addition, the city is also trying to radically change road transport by introducing the Bus Rapid Transport System (the jury is still out on this).



Delhi’s BRTS has been a controversial introduction into the city’s transportation mix and has faced severe opposition from private car owners



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⁴⁷Sinha, B. (2002), ‘Commuters Stay Away from Quick, Clean Ring Railway’, The Times of India, April 22

delhi metro rail corporation



Delhi Metro has become the first rail network in the world to get a UN certificate for preventing over 90,000 tonnes of CO₂ from being released into the atmosphere from 2004 to 2007 by adopting regenerative braking systems in the metro trains which help in deducing its power requirement. Three phase-traction motors installed on them act as generators to produce electrical energy goes back into the Over Head Electricity (OHE) lines. The regenerated energy that is supplied back to the OHE is used by other accelerating trains in the same service line, thus saving overall energy in the system, thus about 30 per cent of electricity requirement is reduced.



Delhi's new metro

© Verma, A.

By the mid-nineties, the boom in car ownership was clearly straining the road network. It was felt that Delhi needed something more than a road-based bus system. To rectify this situation the Government of India and the Government of National Capital Territory of Delhi, in equal partnership set up a company named Delhi Metro Rail Corporation Ltd. (DMRC) on 5th March 1995. The planning for a Metro in Delhi dates back to the 1970s⁴⁸. Actual work towards building the metro, however, only started three years after DMRC was established.

The first phase of the project finished in December, 2005, on budget and nearly three years ahead of schedule⁴⁹. Phase 2 of the network comprises 128 km of route length and 79 stations, and is presently under construction, with the first section opened in June 2008 and a target completion date of 2010. Phase 3 (112 km) and Phase 4 (108.5 km) are planned to be completed by 2015 and 2020 respectively.

With the network spanning 413.8 km by then, Delhi Metro will be larger than London's Underground (408 km)⁵⁰. An average of 500,000 commuters travel underground daily instead of driving their own cars and scooters or packing into buses. The rail investments are yet to achieve its full utilisation as its share of commuter traffic is only a mere 2 per cent⁵¹. It is, however, expected that once all four phases are complete by 2021, the share of commuter traffic for the entire network will go up to about 25 per cent.

⁴⁸Delhi Metro Rail Corporation Ltd, 'Need for a Metro'

⁴⁹Lakshman, N. (2007), 'The Miracle-Worker of the Delhi Metro', BusinessWeek, March 19

⁵⁰Delhi Metro Master Plan 2021

⁵¹Delhi Metro Rail Corporation Ltd, 'Need for a Metro'

2.3.3 kolkata: a city in three stages

Today's Kolkata (earlier called Calcutta) was originally established by the English East India Company as a trading post in the seventeenth century. Till the mid-eighteenth century it was a small, fortified settlement. The above map of Calcutta, circa 1757, shows how it was surrounded by the fortification called the Maratha Ditch. However, after the Battle of Plassey 1757, Calcutta became the capital of the British Empire in the East. A vibrant and densely-built city emerged and by the 1830s, as shown in the following map, it had spilled over the fortifications. The Maratha Ditch was filled in and turned into the Lower Circular and Upper Circular roads (still the city's arterial roads).



Pre-Colonial Calcutta, circa 1757

Courtesy: Sanyal, S.



Calcutta circa 1842

Courtesy: Sanyal, S.

The second round of expansion happened from the late nineteenth century into the early twentieth century. This was driven largely by industrial growth and the introduction of railways with hubs in Howrah and Sealdah stations. Even after the shift of the capital to New Delhi, Calcutta continued to be India's most important economic and cultural centre till the early 1960s. In the seventies and early eighties, an underground metro line was built. It opened in 1984 as India's first underground rail line. Since then, the city has fallen behind cities like Delhi, Mumbai and Bangalore as a centre of economic importance. Nonetheless, the city has continued to evolve gradually. New suburbs like Bidhan Nagar (Salt Lake) and Rajarhat are being created. These new areas have been created mostly on a road based framework. As a result, the urban form of the third stage is much more sprawled than that of the older parts of the city.

The three phases of growth have created a city with a very complex array of transportation systems but it has retained a culture of public transport usage that was embedded in its DNA. The British first introduced (horse driven) trams into the city in 1873, thus putting in place a legacy that continues till today⁵². However the tram system is now in decline. While in the 1980s, the Calcutta Tramways used to carry 0.75 million passengers per day with 275 tram-cars on road, twenty years on, it now carries roughly 0.16 million passengers per day with 170 tram-cars running. Yet, Kolkata continues to maintain its legacy of a vibrant public transport system through its bus network, suburban rail, and under-ground metro rail services. Today a significant majority of Kolkata's citizens continue to rely on public transport and walking as their primary means of transportation.



Kolkata's Famous Trams

© Mohit Midha

The examples of these three cities illustrate that there is a clear link between the history and the future of the city. The way we plan and institute a system of transport in our modern and new cities will hardwire their respective urban forms for decades, perhaps centuries, to come. Since India is yet to build most of its cities, we have an opportunity to inject sustainability into the DNA at an early stage. In particular, we need to draw two important implications from the above discussion:

1. Historical development, particularly of transport systems, can have a huge impact on the future trajectory of a city.
2. The hardwiring of a city can be altered but changing the embedded DNA is difficult. For instance, the retrospective densification of Lutyen's Delhi is probably not advisable as the ring of density around it would now get gridlocked. Delhi now depends on the low density of Lutyen's city in its central core. Moreover, one may often face serious opposition from those who have invested in existing systems. Take the example of the introduction of the BRTS in Delhi. There was a severe backlash against the government because it caused a great deal of inconvenience to those who were using the road space for private cars.

⁵²The Calcutta Tramways Company (1978) Limited, 'History'

2.4 the decline of small town india

Urbanisation in post-independence India has not just been slow but has also been dominated by the very largest cities. More than 15 per cent of India's urban population lives in cities of 10 million or more. The comparable ratio for China is just 5 per cent. Today, the urban agglomerations around Mumbai and Delhi already contain populations of 19 million and 15.9 million respectively. Delhi, Bangalore, Kolkata⁵³ and Mumbai⁵⁴ have grown in size but the quality of life has been severely compromised. These megacities with populations of tens of millions occupy significant mind, media and policy space when one talks of urbanisation in India. The fact, however, is that most of India's urban centres are small towns. The 4,378 urban centres/townships⁵⁵ identified in the 2001 census comprise of only 35 cities with a population of over 1 million.

Figure 9 above illustrates the skewed state of urbanisation in India, where metropolitan cities of Mumbai and Delhi have seen their populations grow at explosive rates even as smaller cities and towns such as Kota in Rajasthan have witnessed much lower growth.

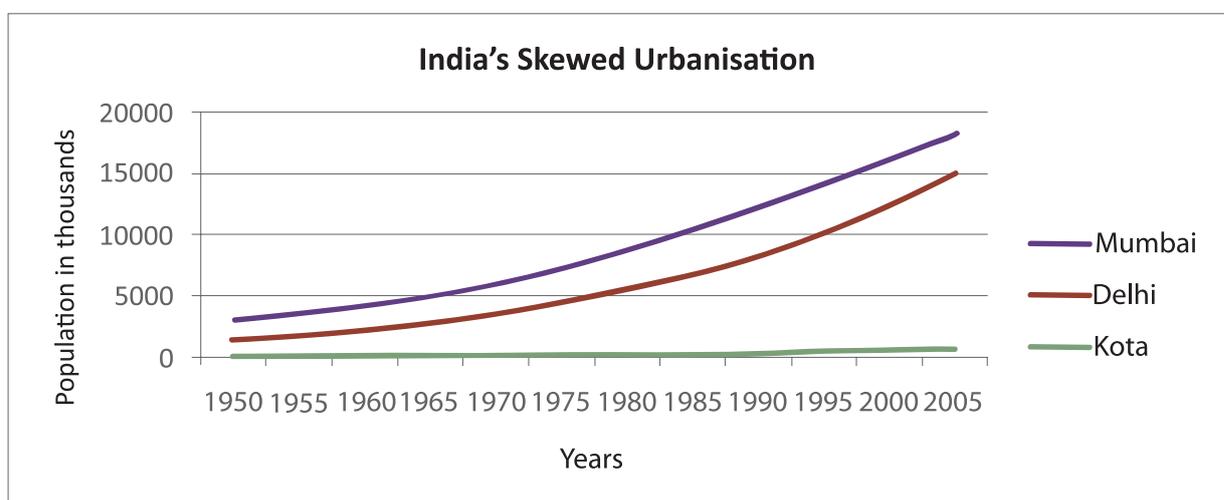


Figure 9: India's Skewed Urbanisation

Source: United Nations Population Division⁵⁶

Growth of smaller centres has been even lower. However, the real deterioration has been in the decline of small towns as centres of economic and social activity. Towns like Allahabad and Aligarh which were once vibrant university towns have seen steady brain drain for the last fifty years. Social institutions, some of them very vibrant in colonial times, have decayed in many of these places. Indeed, there has been a systematic shift of the small-town middle-class to the mega-cities. The migration patterns from rural areas have followed the middle class. Thus, urbanisation today is seen as the direct migration of rural workers from Bihar/Uttar Pradesh to the big cities of Mumbai and Delhi. The small *moufassil* towns of Bihar and Uttar Pradesh do not play a serious role as intermediate centres for migration.

There are many reasons that have caused this bias. A generalised deterioration of municipal governance in small town India has been a major factor. This should not be surprising since the district administrations of most areas are oriented towards rural rather than urban issues. The

⁵³CNN (September 2005), 'Saving Kolkata's Colonial Heritage'

⁵⁴Subramanyam, S. (2004), 'Knowledge Centres', The Hindu Business Line, 30 July

⁵⁵According to the Government of India Census 2001 the break up of these urban habitats are as follows: 1,334 urban agglomerations with population between 10,000-20,000; 1,151 urban centres with population between 20,000-50,000; 888 urban pockets with population between 5,000-10,000, 393 cities with a population of 100,000 or more and 191 urban centres with population of less than 5,000.

⁵⁶World Urbanisation Prospects: The 2007 Revision Population Database (<http://esa.un.org/unup>)

kanpur: the decline of a vibrant industrial town

The Ganges river basin is one of the most densely populated and fertile basins in the world. It is home to a twelfth of the world's population. There are some 30 cities, 70 towns, and thousands of villages along the banks of the river. A large section of the Gangetic river-system lies in the state of Uttar Pradesh, India's most populated, and Kanpur is the biggest city of the state. Kanpur was once the second most industrialised city in India after Calcutta⁵⁷. It is also home to the famous Indian Institute of Technology. However, it is now better known as a heavily polluted and chaotic industrial city that is slowly poisoning the Ganga river.

Kanpur is spread over an area of 260 sq km and has a population of almost 3 million⁵⁸. It is one of the biggest producers of textile and leather products in India. The city is home to 400-odd tanneries from where at least 250 million litres of waste water run straight into the Ganga daily and on days with power cuts, when treatment plants do not work, the number hovers closer to 300 million.

The pollution of the Ganga is not just a threat to the river itself but to the existence of Kanpur and various other cities which have long flourished on the banks of Ganga. The pollution in the river has already rendered the water unfit for drinking and bathing. The pollutants have even contaminated the groundwater and the shortage of water is increasing at a rapid speed. The noxious chemicals have largely killed off the fish that once thrived in the river. Kanpur resident Ashok Mishra says, "Kanpur is drowning in its own filth"⁵⁹.

Collaborative efforts are, at last, being made to revive the ecology of the river. WWF's Living Ganga project, which is funded by HSBC, works in partnership with key local and regional organisations such as the International Water Management Institute, the Indian Institute of Technology, Local Governments for Sustainability (ICLEI), an NGO called Ecofriends, various industry associations, and central and state government institutions. It is developing a framework for sustainable energy and water resource management in a critical stretch of the Ganges river basin⁶⁰. It is too early to judge if these efforts will be able to reverse damage to the Ganga.

decline of old universities and social institutions is another factor. Even when new institutions were built in the post-independence era, no effort was made to link the institution with the wider urban community. For example, the Indian Institute of Technology (IIT) in Kanpur plays no role as a driver of urban re-generation in its host city (see Box "Kanpur: The Decline of a Vibrant Industrial Town"). As a result, Kanpur is better known for its polluting industries rather than the thousands of brilliant engineers it has produced, many of whom played an important role in triggering the global IT boom. Contrast this with the role universities have played in cities in the West – for instance, Boston, Oxford and Cambridge.

There is now some recognition that the smaller centres need help and some efforts are being made in this direction (see Annexure 2). However, we feel that efforts are still not reaching down to the large numbers of really small towns. This is an important issue because the current orientation towards mega-cities is causing a great deal of social, political and economic stress. Note the frequent frictions between native Marathi and the migrant Hindi-speaking populations of Mumbai.

⁵⁷Kanpur City Development Plan, 2006-2012, Jawaharlal Nehru National Urban Renewal Mission, Kanpur Municipal Corporation

⁵⁸Census 2001

⁵⁹Narain, P.P. (September 2008), 'Kanpur's Tanneries Earn it Title of the Worst Polluter of Ganga', Mint

⁶⁰World Wide Fund for Nature, 'For a Living Ganges- India'

2.5 failure of new cities in modern india

India has now been independent for over two generations yet the 'successful' cities of today are still those originally built by the British or even earlier (Chandigarh is perhaps the only exception). Indeed, even within the cities, the old colonial and pre-colonial parts of the city continue to be more attractive than the newly built areas. There are a number of reasons for this failure.

First, the failure to provide adequate urban infrastructure and governance. Even when new urban centres have apparently succeeded, we have found that municipal systems break down within a decade of the growth boom. Gurgaon and the newer parts of Bangalore are good examples of this experience (See Box "Gurgaon- Overwhelmed by Growth"). However, the biggest failure has been one of urban form. As we will argue later in this report, it is not meaningful to think about "infrastructure" without having a vision of the city's urban form. If the overall form itself is fundamentally flawed, the building of more roads and flyovers will not solve the problem.

Second, a related failure is that of not investing in urban "software". The new cities built post independence have been unable to work as vibrant social hubs. Navi Mumbai, built as a satellite city in the seventies to decongest the main city of Mumbai, has failed as a social eco-system: its roads, neighbourhoods and railway stations wear a desolate look compared to the vibrancy of "old" Mumbai. Urban Age notes, "The city in parts remains a ghost city and its vast amount of housing and office buildings are only slowly filling up". Unfortunately, most studies still take a "hardware" view of this failure. Two reasons are usually identified: first has to do with real estate speculation, and secondly, the lack of new bridges over the Thane Creek, connecting Navi Mumbai with the old city. However, we feel that the biggest problem with Navi Mumbai is the lack of urban "software". Even though it has high quality physical infrastructure, it ignored the value of urban software: good pedestrian paths,

parks, museums, theatres, temples, sports facilities and, in general, public spaces that facilitate social clustering and community interaction. As a result, Navi Mumbai has developed as a boring and inhuman space that still lags behind the colonial era charms of the old city. Some efforts are being belatedly made to remedy this, but the overall approach is still an industrial "hardware" one and it is yet to yield real results. The same mistakes have been re-created in the brand new city of Gurgaon.

THE NEW CITIES BUILT POST INDEPENDENCE HAVE BEEN UNABLE TO WORK AS VIBRANT SOCIAL HUBS. [THEY IGNORE] THE VALUE OF URBAN SOFTWARE: GOOD PEDESTRIAN PATHS, PARKS, MUSEUMS, THEATRES, TEMPLES, SPORTS FACILITIES AND, IN GENERAL, PUBLIC SPACES THAT FACILITATE SOCIAL CLUSTERING AND COMMUNITY INTERACTION

gurgaon- overwhelmed by growth

Gurgaon is a flashy boom-town that has emerged, almost overnight, with shopping-malls, condominiums and swanky office towers. It is often touted as “planned” development⁶¹. Yet, it lacks a meaningful municipal waste disposal system. Garbage and raw sewage is simply taken some distance away and dumped. Similarly, till very recently, no thought was given to public transport. As a result, the city, still half-built, already suffers from traffic jams, power shortages and water-supply constraints.



Gurgaon's Sprawl

© Nagrath, S.

When Arun Maira, the former Chairman of Boston Consulting Group (presently Member, Planning Commission, Government of India) in India moved to Gurgaon he was impressed with the sense of space that the city projected. “There were a few high-rises but they were scattered here and there. The overall feeling was still of a less congested city.” Five years down the line he has reason to be disappointed. Urban ‘development’ in Gurgaon, part of the National Capital Region and one of Delhi’s 4 satellite towns, has spiraled out of control. “There are buildings everywhere and these office and residential complexes are little islands providing lifestyles and services unheard of in India till recently.” But between these islands there is chaos and breakdown of law and order he says⁶². Gurgaon he points out is a city with modern glass and concrete structures but feudal infrastructure. “It just grew too fast. It became a city while governance and infrastructure capabilities were still oriented towards a village.” According to Maira, who is also involved with a local NGO, Society for Urban Regeneration of Gurgaon and its Environs (SURGE), the fundamental problem here has been the fact that urbanisation has been driven by bad planning and a thought process which doesn’t believe in devising viable urban spaces. The philosophy, he says, seems to be to let people

⁶¹Urban development in Gurgaon is a joint operation of the government and the private sector. The government agency, HUDA and over 45 private players are involved in Gurgaon's property market; Integrated City Making, Urban Age (LSE, 2008)

⁶²Huge tracts of land were given to private developers in Gurgaon. “These developers, over time, appropriated most designated green spaces and public spaces, extracting as much revenue as they could out of the land. So a city was created, but the opportunity of setting new benchmarks in civic life was lost.”; Integrated City Making, Urban Age (LSE, 2008)

failure of new cities in modern india

build residences and offices arbitrarily and as they get occupied, infrastructure and other economic activity will follow. This is a prime example of ad hoc and unsustainable urbanisation.

Umesh Anand, Editor and Publisher of Civil Society magazine is even more vehement in his indictment of present day Gurgaon. "Liveability in Gurgaon has gone down considerably in the last few years. There is absence of public transport as well as sewage and waste disposal systems; there are inadequate police personnel and a complete absence of a sustainable and reliable water supply." All this, he says stems from an absence of a vision for urban India and a complete failure of governance.

The above reaction from some of Gurgaon's leading citizens is damning. Yet, the city was built only from the nineties and suffers no lack of financial muscle. So what went wrong? Three things in our view.

First, the city was sliced up into large sections that were handed to developers but there was little effort to maintain overall urban order. A district administrative apparatus oriented to a largely rural population was suddenly given the task of running a large city (now estimated to have 3mn inhabitants). Meanwhile, in the absence of government supervision, the real estate developers took a great deal of liberty in the way they planned and executed their townships. As a result the infrastructure of city is either grossly inadequate or totally uncoordinated and misaligned.

Second, the urban form of Gurgaon was envisaged on an outdated vision of a road-based suburbia. Indeed, for many years, the municipal laws deliberately discouraged densification. Public transport was not given much importance. Walkability was hardly considered and there are virtually no footpaths and pedestrian underpasses in the city even today. There is a national highway (NH8) that bisects the city but there are few places that one can cross it by foot. As a result the city is structurally fractured.



Gurgaon's Sprawl

© Nagrath, S.

Finally, in common with Navi Mumbai, there is no thought of urban software. The city consists of office blocks, shopping malls and gated communities. There are very few public spaces of any kind. The few green areas are in form of private golf courses – hardly conducive for creating a vibrant urban community. There are very few places for generalised social interaction such as public parks, sports complexes, temples, art hubs and so on. Indeed, it is even difficult to identify a city centre. The result is a largely soulless collection of buildings that do not add up to a vibrant city.

Very recently, there has been a belated effort to remedy the situation. The Delhi Metro is being extended to Gurgaon. A new municipal governance structure is also being developed. However, as we have seen, it is difficult to change the DNA of a city once it has been embedded. Hopefully, it is not too late for Gurgaon.

chapter 3

alternative urban futures:
options for india



3.1 energy

Cities are major users of natural resources ranging from water and energy to land and food. They also produce a wide range of harmful pollutants – carbon dioxide, solid waste and sewage. All these issues need to be considered but, in this report, we have mainly focused on energy and to a lesser extent on water and waste. Of course, much of the same analysis can be easily applied to other areas.

Figure 10 shows how the availability of electricity is growing rapidly but is unable to keep up with demand. Although some increase in energy use is inevitable, both in total and in per capita terms, we feel that there is a broad range of future trajectories for India. Since economic development is closely linked to urbanisation, the future trajectory of energy use (and that of other resources) will be closely linked to the types of urban centres we build.

In Chapter 1, we saw how the ecological footprint of Barcelona was a fraction of Atlanta's footprint. So what should India's urban planners focus on? According to a study by The Energy and Resources Institute (TERI), transportation consumes 17% of energy in India while residential and commercial users (a proxy for buildings) consume 15%. We do not have data specifically for Indian cities but the shares of transport and buildings are presumably larger for urban areas. Thus, in this chapter we look at the implications of various strategies for transportation and building design. We also look at scenarios for water and waste.

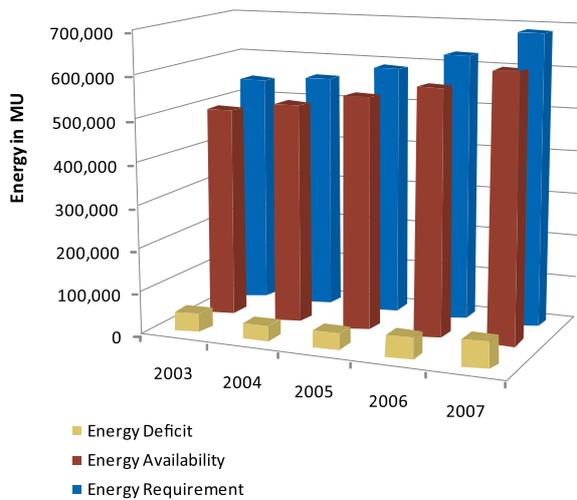


Figure 10: Power Availability across India
Source: Central Electricity Authority (CEA)⁶³

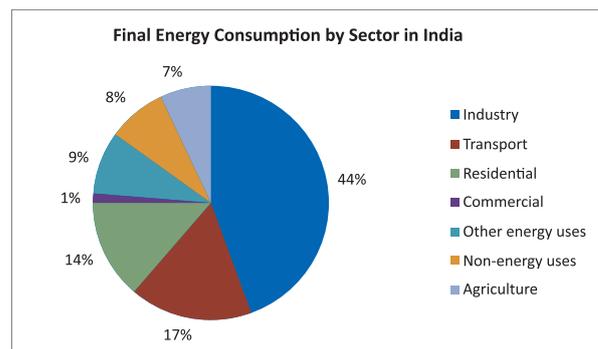


Figure 11: Final Energy Consumption by Sector in India
Source: TERI⁶⁴

⁶³Central Electricity Authority (CEA) (January 2008), 'Power Scenario at a Glance'

⁶⁴TERI Energy Data Directory and Yearbook (2007); Final Energy Consumption, By Sector, in 2005/06

3.2 transport

The transport sector is the world's most important consumer of petroleum products, accounting for 58 per cent of total global consumption in 2004 (IEA 2007). Most of this fuel consumption comes from road transport (IEA 2007). Car ownership has been growing rapidly in Asia. Scenarios that look at vehicle/energy use and emissions for South Asia (Bose, 2007) find that the sudden growth in vehicle use has resulted in traffic congestion, fuel use and CO₂ emissions, and in deteriorating air quality. The forecasts show that if current trends continue, motor vehicles will double, fuel use and CO₂ emissions will triple, and pollution will rise exponentially by the year 2020. Nonetheless, as shown in Figure 12, affluence need not imply continuously worsening pollution. Cities like New York and London had very poor air quality in the early twentieth century but now have far better air quality than Indian cities. Urban form clearly has a large impact on the trajectory – and the embedded DNA of the city can be an important factor affecting future energy use. For instance, in Mumbai approximately 55 per cent⁶⁶ of the people walk to work, whereas in Delhi the proportion is 32 per cent. A relatively small proportion of Kolkata's population relies on walking but a large share uses public transport. Car usage is the highest in Delhi of any Indian city and even public transport has historically relied on road systems (although this may be slowly changing with the introduction of the Delhi Metro). Thus, it is important to compare the relative merits of different trajectories with a view to guiding the future path of India's urbanisation.



Traffic Jams in Gurgaon's Brand New Roads

© Verma, A.

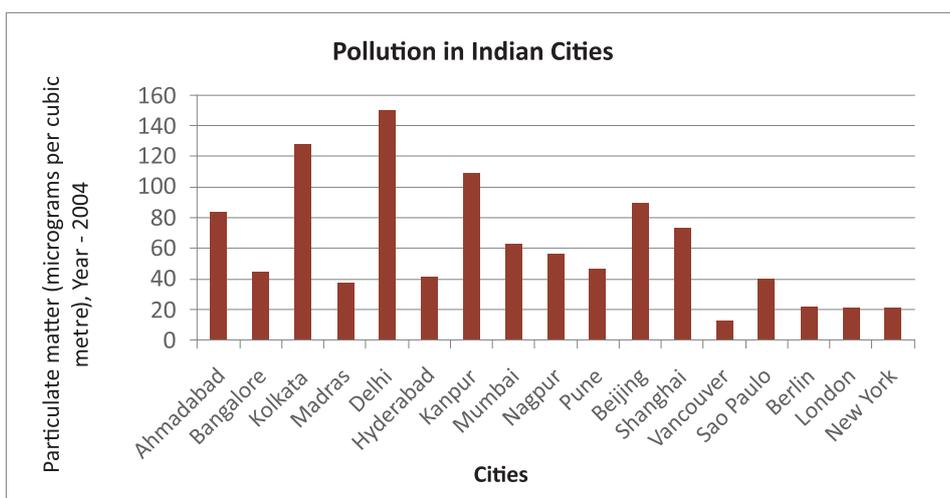


Figure 12 Pollution in Select Indian and World Cities

Source: World Bank⁶⁵

⁶⁵2007 World Development Indicators, Original data from World Bank study by Kiran D. Pandey, David Wheeler, Bart Ostro, Uwe Deichman, Kirk Hamilton, and Kathrine Bolt, "Ambient Particulate Matter Concentration in Residential and Pollution Hotspot A"

⁶⁶Urban Age, Mumbai, 'Transport – Internal Mobility', 2007

3.2.1 drivers of energy demand with respect to transport

The energy demand (consumed) by the transport sector in a city is determined by the following factors:

- a) mode of transport,
- b) number of trips made by citizens in a day,
- c) the length of the trip, and
- d) speed of travel.

However, the total transport demand is determined by:

- a) population,
- b) urban form,
- c) availability of soft and hard infrastructure, and
- d) governance (existing regulatory/policy framework including taxation).

3.2.2 energy consumption in transport: paths to 2050

We now look at different scenarios or ways in which selected cities in India could develop in the future, by modelling the different modes of transport available to the city's citizens and the associated energy consumption patterns for the future. The modelling framework chosen for the study is based on established literatures. For instance a report by the McKinsey Global Institute (Energy Productivity Opportunities, May 2007) derives the demand for fuel based on the vehicle miles traveled and on the average fuel economy. Similarly, a World Bank report (Bose, 2007) uses a comprehensive analytical framework to assess energy used by the transportation network based on the activity, modal share and the energy intensity.

This report takes these studies as starting points in developing the methodology for computation of future energy demand in chosen cities in the country. The model estimates total energy consumption based on the varying transport modes in use within a city – that for mass transit and non-mass transit. The total energy consumption of a city is thus:

ENERGY CONSUMPTION IN TRANSPORT SECTOR

$$TE_x = \sum_{i=1}^n PDE$$

Where, TE_x equals the total energy consumption for a city 'x'

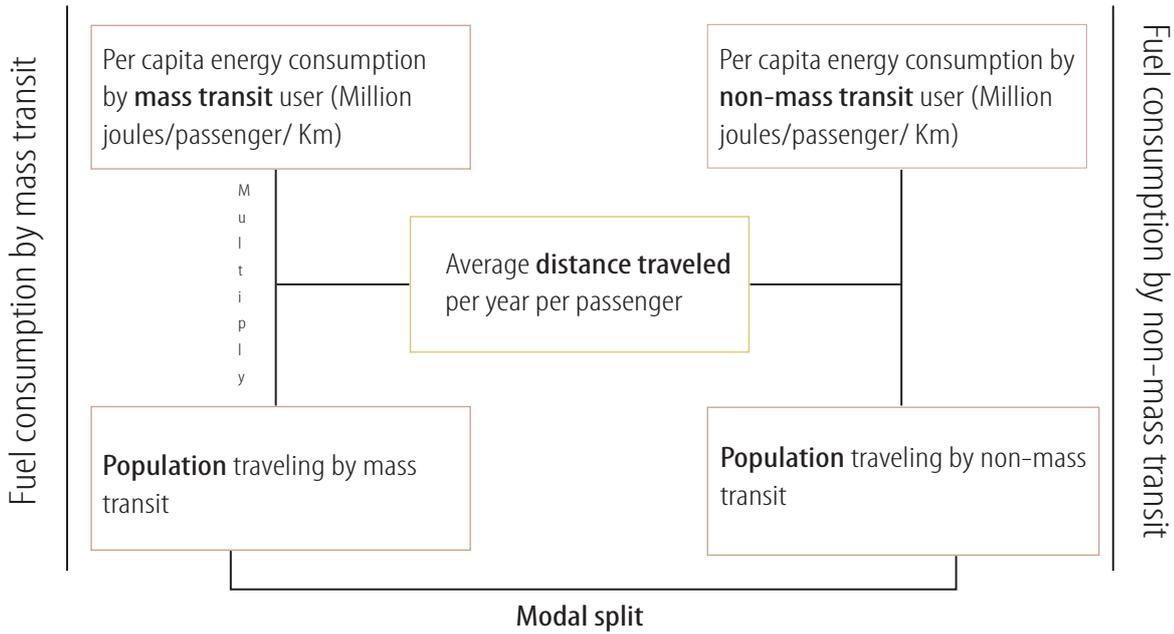
P is the total number of persons using a transport mode

D is the average annual distance travelled per capita

E is the per capita energy consumption by transport mode

and, i refers to the different transport modes

CONSUMPTION OF ENERGY FOR TRANSPORT SECTOR



The estimations are based on the following assumptions:

- The transport modes are split into: mass transit, non-mass transit and walk,
- The energy consumption associated with mass transit vehicles is 0.64 million joules/passenger/km⁶⁷,
- The energy consumption associated with non-mass transit vehicles is 1.78 million joules/passenger/km⁶⁸,
- Mass transit includes bus, metro and three-wheeler,
- Non-mass transit includes car, taxi and two-wheeler, and
- Non-energy consuming forms of transport include walk, cycle and rickshaw.

PARAMETERS	BUSINESS AS USUAL	DENSIFICATION	MODAL SPLIT AND DENSIFICATION
Modal split	There is a 2.5 per cent shift from mass transit to non mass transit vehicles by 2020 and an additional 2.5 per cent shift to non-mass transit vehicles by 2050.	Modal split remains the same in 2020 and 2050 as in 2001.	There is a 2.5 per cent shift from non-mass transit to mass transit by 2020 and a further 2.5 per cent in 2050, except for Kolkata where modal split shift only by 0.5% ⁶⁹ .
Average travel per person in a day	The city continues to sprawl, thus the average distance travelled by a person increases by 2.5km in 2020 and additional 2.5km in 2050.	The average distance travelled by a person remains constant as in 2001. The city maintains its boundaries and builds vertically.	Revised mix land use policies mean that the average distance travelled by a person decreases by 1km in 2020 and additional 1km in 2050, except for Ahmedabad where distance travelled decreases by 0.5 Km ⁷⁰ .

⁶⁷Kenworthy J, Townsend C. (June 2002), An international Comparative Perspective on Motorisation in Urban China – Problems and Prospects, IATSS Research

⁶⁸Ibid.

⁶⁹In Kolkata only 2% people use non mass transit modes of transport like cars and two wheelers. It is therefore not possible to decrease this usage by a significant amount

⁷⁰In Ahmedabad the travel distance is already relatively small. It would be difficult to further reduce the travel distance by a significant amount

energy consumption in transport

The scenarios have been mapped for the following cities:

PARAMETERS	DELHI	KOLKATA	AHMEDABAD
Population	The population of Delhi in 2007 has been estimated as 16.7 million. The Delhi government has projected that the population of the city will increase by 3 per cent per annum ^{71,72} .	The population of Kolkata in 2002 was 14.9 million. The Kolkata government has projected that the population of the city will increase by 1.4 per cent per annum ^{73,74} .	The population of Ahmedabad in 2003 was 4.8 million. The Ahmedabad government has projected that the population of the city will increase by 2.6 per cent per annum ^{75,76} .
Modal split	The modal split of Delhi in 2007 was Mass Transit (32 per cent), Non-Mass Transit (23 per cent), Walk and cycle (45 per cent) ⁷⁷ .	The modal split of Kolkata in 2002 was Mass Transit (82 per cent), Non-Mass Transit (2 per cent), Walk (16 per cent) ⁷⁸ .	The modal split of Ahmedabad in 2003 was Mass Transit (17 per cent), Non-Mass Transit (28 per cent) and Walk and cycle (55 per cent) ⁷⁹ .
Average travel per person in a day	The average distance of travel per person per day is 7.7 km ⁸⁰ .	The average distance of travel per person per day is 7.9 km ⁸¹ .	The average distance of travel per person per day is 3.5 km ⁸² .

Scenario Mapping

Note: Base years for different cities are different due to data unavailability, therefore projections not strictly comparable.

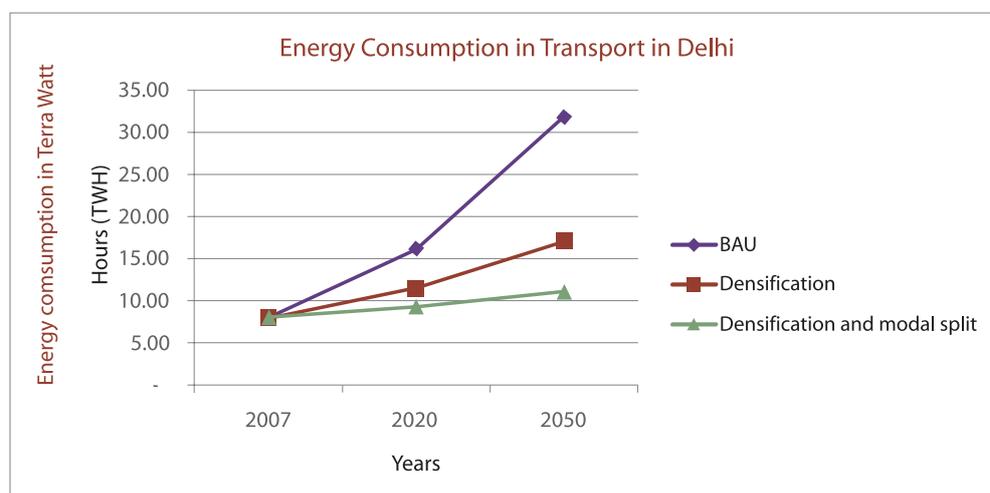


Figure 13: Energy Consumption in Transport Sector in Delhi

Source: MAPL Analysis

⁷¹Delhi Statistical Handbook 2006, Directorate of Economics and Statistics, Government of National Capital Territory of Delhi

⁷²The population of Delhi as per 2001 census was 13,851,000. The Government of NCT of Delhi has projected the population growth at the rate of 3.2% annually until 2026. For the purpose of scenario mapping the population growth rate has been taken as 3.2% until 2015, 2% until 2030 and 1% until 2050.

⁷³City Development Plan Kolkata 2006-2012, Jawaharlal Nehru National Urban Renewal Mission, Kolkata Municipal Corporation

⁷⁴The population of Kolkata in 2001 as per Kolkata CDP was 14,720,000 and the projected growth at the rate of 1.6% annually until 2011, 1.5% until 2021 and 0.56% until 2035. For the purpose of scenario mapping the same population growth rate has been taken till 2035 and from 2035 until 2050 as 0.58%.

⁷⁵City Development Plan Ahmedabad 2006-2012, Jawaharlal Nehru National Urban Renewal Mission, Ahmedabad Municipal Corporation and Ahmedabad Urban Development Authority

⁷⁶The population of Ahmedabad in 2001 as per the CDP was 14,720,000 and the projected growth at the rate of 2.6% annually until 2035. For the purpose of scenario mapping the same population growth rate has been taken till 2035 and from 2035 until 2050 as 1.6%

⁷⁷RITES Pvt Ltd(2007), RITES primary survey

⁷⁸World Bank, India's Transport Sector: The Challenges Ahead, May 2002, Pg 59, table 9: Household Travel Characteristics in Various Cities

⁷⁹RITES Ltd(2003), RITES Primary Survey

⁸⁰World Bank, India's Transport Sector: The Challenges Ahead, May 2002, Pg 59, table 9: Household Travel Characteristics in Various Cities

⁸¹Ibid.

⁸²Ibid.

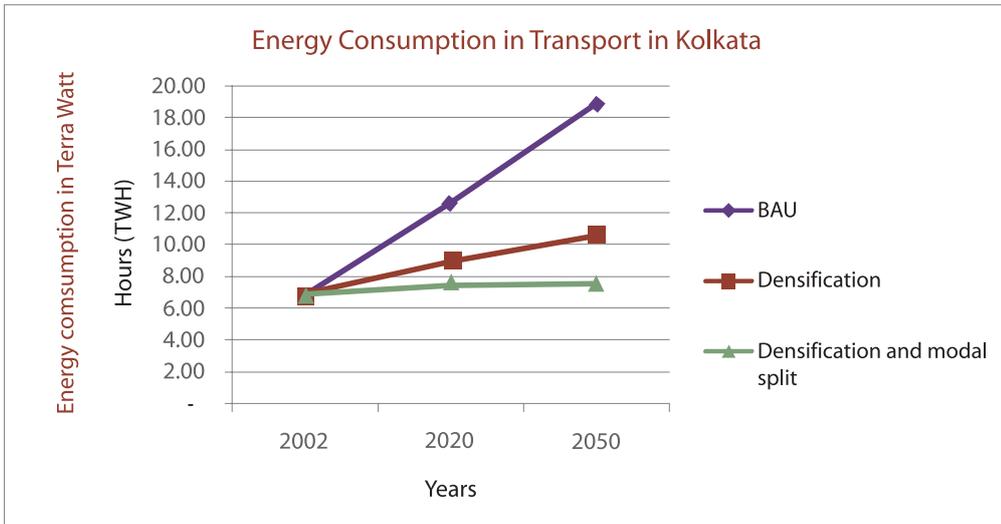


Figure 14: Energy Consumption in Transport Sector in Kolkata

Source: MAPL Analysis

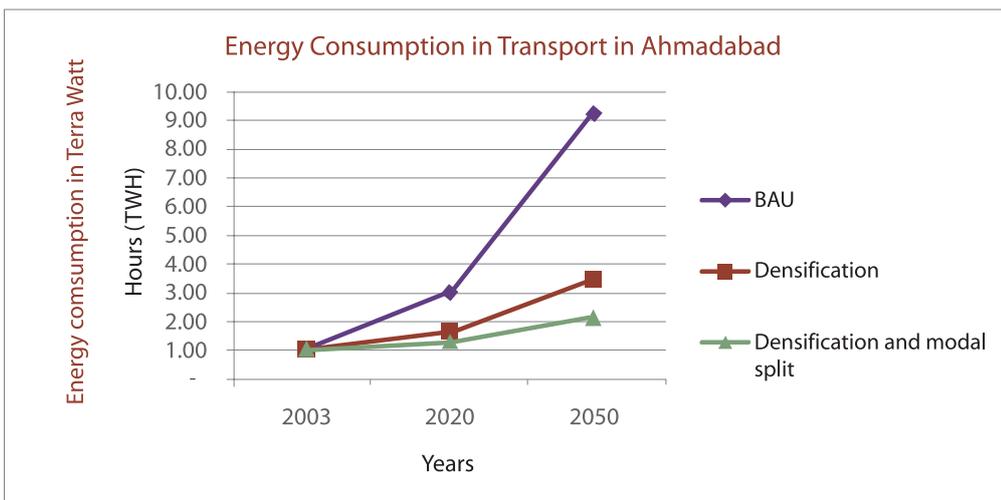


Figure 15: Energy Consumption in Transport Sector in Ahmedabad

Source: MAPL Analysis

As shown in the above scenarios, urban form and transport systems can have a large impact on the trajectory of energy use. This is especially true of sprawled megacities like Delhi. As India begins to urbanise more rapidly, it will need to act soon since the historical development of transport systems tends to hardwire cities for decades, if not centuries. Indeed the historical development of our cities' transport systems to a large extent defines their urban form.

3.2.3 importance of walkability

Much has been said about the importance of public transport systems vis-à-vis private vehicles. However, public transportation is almost always viewed in India in terms of buses, trains and so on. Walking is not seen as a means of transport. In fact, **walking is the single most important means of transport** in even large cities like Mumbai (see Figure 16). In smaller cities, distances are smaller making walking and cycling even more important as modes of transport. Furthermore, all forms of public transport require the 'last mile' to be walked. Thus, the apparent unwillingness of Kolkatans to walk is exaggerated by the data in the chart as it ignores the walk to the public transport stop. Without pedestrian connectivity, buses and rail networks cannot function efficiently. In short, walkability is critical to any urban design that aims for sustainability because of its impact on density, public transport and its own use as transportation.

So what is "walkability"? We define it as the ability of the average citizen to lead his/her life (work and leisure) by relying on walking as the main mode of transport. This involves infrastructure such

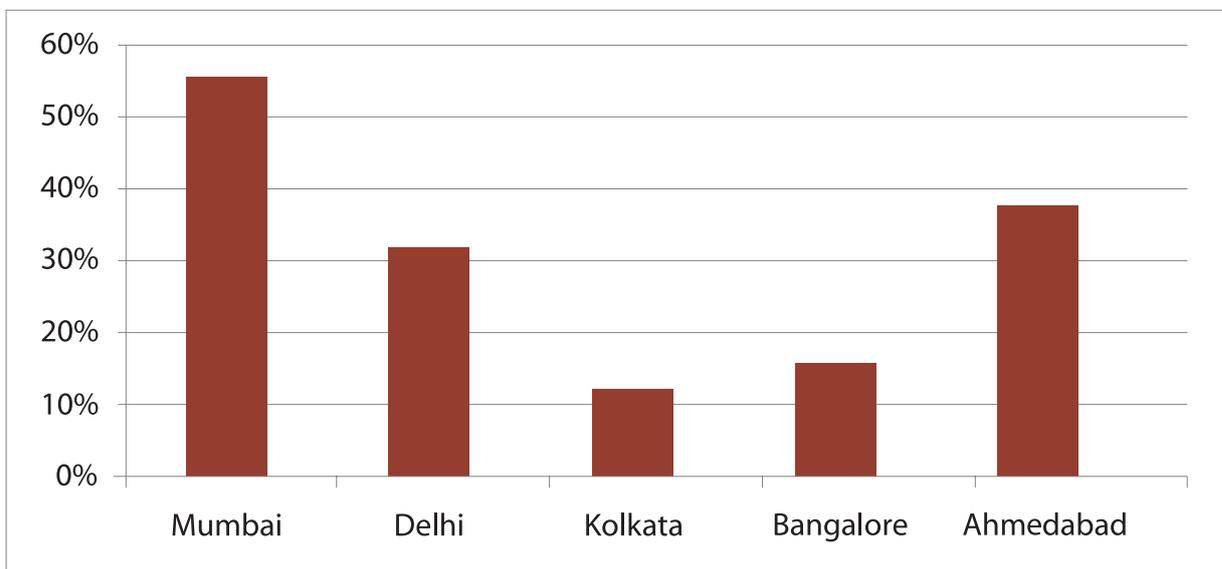


Figure 16: Percentage of People Who Rely on Walking in Indian Cities

Source: Urban Age, RITES⁸³

as side-walks and foot-paths, under/over passes, shade, street-lights, safe road crossings, and more. Note, however, that this is not the same as pedestrianisation but a much broader framework of thinking. For instance, creating sidewalks in a sprawled urban form would not necessarily make the city walkable. Thus, embedded within "walkability" are several other concepts such as density, mixed use, public spaces, access to public transport, security and so on.

Note that the management of public spaces like parks and their integration into the walking experience are very important for walkability to work. Walkability is not just environmentally friendly but it is a way for making the city much more socially and economically vibrant and inclusive. Walking is accessible to all layers of society and is good for social cohesion; walking also has a positive impact on health. Similarly, we know how a vibrant street culture in cities like New York and Paris has been instrumental in giving them a "buzz"; this gives the cities a distinctive personality enhancing their attractiveness as locations, thereby also resulting in large economic benefits through improvements

⁸³Urban Age, London School of Economics & Political Science (2008), 'Integrated City Making: Governance, Planning and Transport'; RITES Primary Survey (2004)

that follow in sectors ranging from real estate to tourism. In other words, walkability is very important for the success of a city. Public spaces provide the arena for all this interaction and must be tied into the logistics of walking.

In our view, therefore, walkability is the single most important paradigm that should be considered for urban planning. It is an excellent strategy to encapsulate social inclusion, health, public spaces, transportation, density and ecological sensitivity. Indeed, every effort should be made to embed it into the DNA of India's cities. Unfortunately, walkability is not given serious thought in India (see Box "Power to Pedestrians"). The focus in Indian cities seems to be on building roads and not in investing in infrastructure for non-motorised transport systems. Indeed, many Indian cities appear to be deliberately working against walkability. In many cases, side-walks have been swallowed by "road-widening" schemes. For example, in Delhi, the total funds allocated for the transport sector doubled from 2002-03 to 2006-07 – however 80 per cent of the earmarked money went towards schemes aimed at widening or extending roads in one form or another!

power to pedestrians⁸⁴

The rich and powerful continue to enjoy special privileges and wield influence completely disproportionate to their numbers. They also appropriate a far bigger share of public expenditure than is justified. Power to the people, is a slogan now rarely heard. To many, all it means is electrification of homes! Yet, these four words have the force of history behind them. They connote a philosophy, a system of governance, which has swept across the globe, laying low many a king, feudal lord and dictator. Not all autocrats and despots have disappeared yet, but the idea of people's power has certainly shaken them.



Walking is a Form of Transport for a Majority of India's City Dwellers

©Verma, A.

Democracy is a necessary means of empowering people; however, to the extent it is restricted to voting, it is far from sufficient. Electoral democracy has many limitations — even drawbacks — especially when it degenerates into majoritarianism or unregulated licence. Oppression of the few by the many is, unfortunately, not an unknown by-product of democracy. Ironically, the reverse — small organised groups of hoodlums holding the majority to ransom (as in many bandhs and strikes) — is also facilitated by "democratic freedom" and encouraged by vote-bank politics. If empowerment of every individual is the goal, it is necessary to go beyond mere elections and ensure: participatory democracy; tolerance and encouragement of diversity in life-style and thought; decentralisation of political and economic power; and equitable access to information, communication and education.

Decentralisation — through the creation of a third level of formal governance by constitutional amendments empowering

⁸⁴Karnik, K., The Economic Times (5 March 2009), pp 14

importance of walkability

panchayats and urban local bodies —and the Right to Information Act have, together, given a huge boost to grass-roots democracy and accountability. Potentially, these are revolutionary steps in truly transferring power to the people. Yet, the actual realisation of this is stymied by many obstacles and sometimes contradicted by other measures. The rich and powerful continue to enjoy special privileges and wield influence completely disproportionate to their numbers; they also appropriate a far bigger share of public expenditure than is justified. The plight of the pedestrian is a good metaphor for this.

Political netas and corporate leaders are hardly ever seen walking in the streets of our cities (though a few do run on them during marathons). Therefore, pedestrians — mostly the ubiquitous but indefinable “common man” — get short shrift. Over the last few years, the motor car has been getting ever greater precedence over the pedestrian and the cyclist. Footpaths have been shrinking in a flurry of road-widening projects, and even existing cycle-lanes have disappeared. An attempt in Delhi to give precedence to cycles and buses through dedicated lanes (as part of a bus rapid transit system) has met tremendous resistance from motorists. Fortunately, following its success in Delhi, a “metro” (train) system is now being put in place in major cities. However, one is not sure if this is a genuine recognition of the dire need to create mass public transportation systems, or is merely the flavour of the day.

The doubt about decision-makers’ serious commitment to efficient public mobility arises from the contrast between the hundreds of crores being spent on flyovers and road-expansion in cities, and the distinct miserliness and lethargy with regard to procurement of buses and facilities for pedestrians. The priority for cars at the cost of pedestrians is evidenced by the “free left turn” at traffic signals. While this facilitates the movement of vehicular traffic, the resulting continuous flow means that a pedestrian wanting to cross the road must either be capable of out-running Usain Bolt, or be a great believer in re-incarnation! Pedestrian over-bridges and skywalks would be solutions but these, unlike the proliferation of fly-overs, are a rarity. Escalators and lifts to help the aged or differently-abled to use overbridges — where they exist — are, of course, unaffordable, unlike fly-overs! Pedestrian subways are but few; in Delhi, the aspiring world-class city, they are so filthy and unsafe that no one uses them. This, but naturally, does not bother decision-makers.

In contrast, in many cities around the world, the pedestrian is getting increasing importance — and space. In London — a second home to many of India’s rich and powerful — the width of the foot-paths on Oxford Street, for example, is probably double that of the road. Despite the very heavy traffic and constant congestion, no one even thinks of widening the road at the cost of the foot-path. In many other cities, particularly in Europe, large areas are “pedestrian-only” zones. The result, despite adverse weather for many months in the year, is far more walkers. Most people there walk to and from the nearest station or bus stop. In contrast, our shrinking, uneven and often non-existent footpaths discourage walking. Those who do walk are often left with no option but to use the road — disrupting traffic and risking injury. Little wonder that Indians prefer to use a car even for short distances. On the other hand, London and Singapore, amongst other cities, levy steep congestion charges on cars entering designated parts of the city, thereby discouraging use of private transport while reducing pollution and traffic density.

In most countries, public authorities and vehicle drivers respect pedestrian rights, giving walkers the right-of-way in many situations. In India, cars run on fuel power, but also on feudal power: they assume almost divine right-of-way everywhere. Government’s actions — through its investment policy, priorities and its disdain for pedestrians — reinforce this sense of superiority. Even in Mumbai, a city in which the offspring of the upper-classes too used to travel to school or college by bus or the “local” (train), the change is perceptible; driven, doubtless, by the neglect and decay of a public transport system trying hard to retain its legendary efficiency.

To make “power to the people” beyond mere cliché, what better way than by empowering pedestrians? Here is an opportunity for the central and state governments to work closely with the third tier, the urban body, and initiate a major exercise in pedestrianisation; to put this in the same class, and with similar priority and resources, as building fly-overs or modernising airport terminals. Industry and civil society must play a major role in shaping this new societal architecture and life-style, one that is environment-friendly and empowering.

Source: Op-ed in The Economic Times by Kiran Karnik; the author is a strategy and policy analyst & President, India Habitat Centre

A few researchers have recently noted that the “general political neglect of walking” and the “marginalisation of footpaths” as major obstacles in promoting walking and cycling as a major means of transportation⁸⁵. However, these are a tiny minority and the bulk of the debate totally ignores this issue. Indeed, our survey of city development plans across India found that there is very little mention of walkability or of pedestrians. Many of the plans do not mention them at all (see Annexure 5).

During our research, we learnt that most municipal officials, academics and planners do not even consider walking as transportation. When prodded, they responded that Indians do not like to walk except under compulsion. Others argued that India’s weather is not conducive to walking⁸⁶. Yet a large proportion of Indians walk. A 2008 study of 30 cities showed 16-57 per cent of all trips involved no vehicles at all (see Figure 17)⁸⁷. Smaller cities and hill towns, where walking commands a greater share of trips, figured at the higher end of this classification. Bigger cities have fewer people relying only on walking although more people use public transport and presumably walk the ‘last mile’.



Brand New Roads in Delhi and Gurgaon Do Not Cater to Pedestrians

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CITY CATEGORY	POPULATION	WALK	CYCLE	TWO WHEELER	PUBLIC TRANSPORT	CAR	IPT/AUTORICKSHAW
Category 1-a	< 0.5 million (plain terrain)	34	3	26	5	27	5
Category 1-b	< 0.5 million (hilly terrain)	57	1	6	8	28	0
Category 2	0.5 -1 million	32	20	24	9	12	3
Category 3	1 - 2 million	24	19	24	13	12	8
Category 4	2 - 4 million	25	18	29	10	12	6
Category 5	4 - 8 million	25	11	26	21	10	7
Category 6	> 8 million	22	8	9	44	10	7
National		28	11	16	27	13	6

Figure 17: Transport Mode Share (%), 2007

Source: Wilbur Smith Associates⁸⁸

⁸⁵Urban Age, London School of Economics & Political Science, ‘Integrated City Making: Governance, Planning and Transport’

⁸⁶We consider the “weather” argument especially absurd. It is true that India is very hot in summer but walking in the heat is no more uncomfortable than walking in the cold of Northern Europe in winter. In any case, people are willing to walk in hot tropical cities like Singapore (which, unlike most of India, is hot and humid all year round and suffers thundershowers almost every day). We feel, therefore, that the real issue for India is the quality of walking infrastructure.

⁸⁷Wilbur Smith Associates (sponsored by Ministry of Urban Development), 2008, ‘Traffic and Transportation Policies and Strategies in Urban areas in India’; data may not be directly comparable with those from other sources.

⁸⁸Data may not be comparable with estimates by other agencies

importance of walkability

The study commissioned by the Ministry of Urban Development, assessed footpaths and overall infrastructure, including pedestrians' ratings of the facilities. It indexed cities for Walkability (see Figure 18). The national average was 0.52; Chandigarh came on top with 0.91. By comparison, large international cities such as London score 1.5 to 1.7. Smaller cities in Europe often do better. In short, Indians walk despite the poor pedestrian infrastructure.

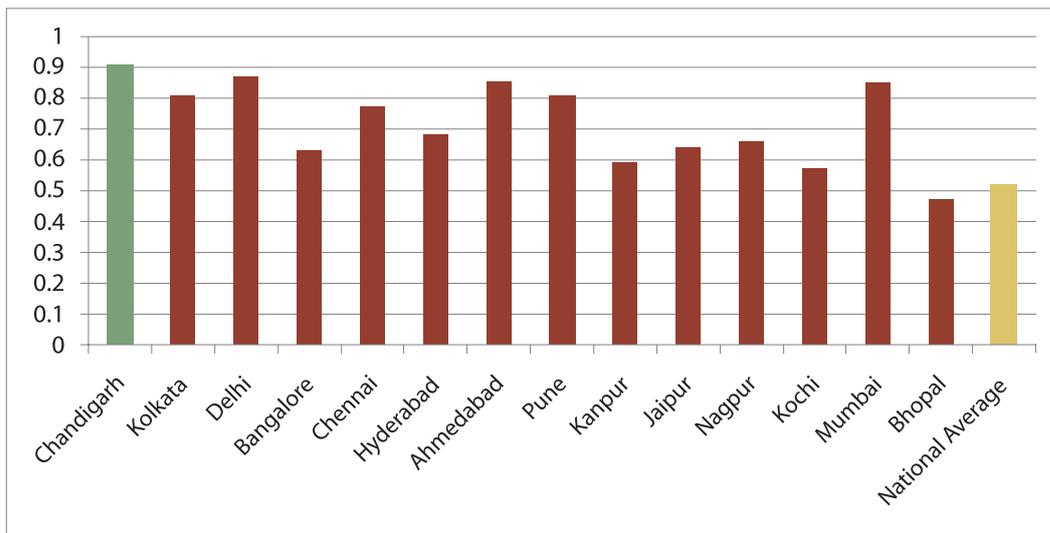


Figure 18: Walkability Index⁸⁹

Source: Wilbur Smith Associates⁹⁰

WALKABILITY IS NOT JUST ENVIRONMENTALLY FRIENDLY BUT IT IS A WAY FOR MAKING THE CITY MUCH MORE SOCIALLY AND ECONOMICALLY VIBRANT AND INCLUSIVE. MANAGEMENT OF PUBLIC SPACES LIKE PARKS AND THEIR INTEGRATION INTO THE WALKING EXPERIENCE ARE VERY IMPORTANT FOR WALKABILITY TO WORK

⁸⁹Walkability Index is calculated as $[(w1 \times \text{Availability of footpath}) + (w2 \times \text{Pedestrian Facility rating})]$; Where, w1 and w2: Parametric weights (assumed 50% for both); Availability of footpath: Footpath length / Length of major roads in the city; Pedestrian Facility Rating: Score estimated based on opinion on available pedestrian facility

⁹⁰Wilbur Smith Associates (sponsored by Ministry of Urban Development), 2008, "Traffic and Transportation Policies and Strategies in Urban areas in India"

3.3 buildings

Buildings are responsible for up to 40 percent of energy used in most countries⁹¹. Comparable data is not available for India but TERI's calculations suggest that it would account for around 15% (residential plus commercial). This may be mostly a reflection of fact that a large part of the population still lives off the power grid or lives in traditional homes in rural areas. Even in urban areas, a large part of the population has either limited access or cannot afford energy-consuming appliances and household gadgets. All this will change with affluence and therefore we need to think about the future of building construction/design as well as about retro-fitting existing structures.

Another important difference with countries that are already urbanised and have a large existing stock of buildings is that India is now spending more energy in construction rather than on running buildings. It is estimated that about 20 to 25 per cent of India's total national energy demand is generated by the manufacturing materials required in the building sector, while only 15 per cent goes into the running needs of the buildings. Of course, this will change over time as the mix of new and existing buildings changes. For now, there may be large gains from improving the industrial processes that produce building material.

Modelling of industrial processes is beyond the scope of this report, so we have focused on building design. Research conducted by the Ministry of Power, Government of India, points out that about 20 to 25 per cent of the total electricity utilised in government buildings in India is wasted due to unproductive design features of buildings⁹². So, should we give priority to enforcing "green" building codes?

3.3.1 energy consumption in buildings sector

The energy demand of the building sector of a city is determined by the following factors:

1. Increase in Urbanisation

When people shift from rural to urban areas, the demand for housing increases.

2. Economic Development and Rising Incomes

Economic development and rise in incomes results in an increase in the demand for housing.

3. Urban Form and Regulatory Roadblocks

A study conducted in New York City showed that low-density suburban development is more energy and GHG intensive (by a factor of 2.0–2.5) than high-density urban core development on a per capita basis. When the functional unit is changed to a 'per unit of living space' basis the factor decreases to 0.67. In India, the legal Floor Space Index (FSI) in many cities is very low which prohibits people from building high rise buildings. Legally, in Mumbai it is as low as 1.33 as compared to 12 in New York and 17 in Shanghai (of course, Mumbai still has a very high population density but this is achieved through illegal construction, slums and extreme compromises on personal space). In addition, many Indians continue to prefer staying in single-family houses rather than high rise apartments.

⁹¹Energy Efficiency in Buildings, Business realities and opportunities, WBCSD(July 2008)

⁹²Palit, D. (June 2004), 'Green Buildings', An Occasional Paper Prepared for World Energy Efficiency Association, The Energy and Resources Institute (TERI)

4. Construction Materials and Use of Appliances

According to a World Business Council for Sustainable Development (WBCSD) study, manufacturing, construction, transport of material, and, maintenance and renovation consume 16 per cent of total energy consumption during the full life of a building. The rest of the 84 per cent of energy is consumed by the use of various appliances on a day to day basis in the building like, heating, ventilation, cooling, computers, cooking etc. For the purposes of our scenario analysis we have ignored the energy use of inputs into building construction. This requires modeling of industrial processes that is beyond the scope of this report.

3.3.2 energy consumption by buildings: paths to 2050

This section will provide different scenarios or ways in which selected cities in India could develop in the future. The modeling framework chosen by the study is based on established literatures, for instance a report by WBCSD "Energy Efficiency in Building, Business Opportunities and Realities". This report takes these studies as starting points in developing its methodology for computation of future energy demand in chosen cities in the country.

ENERGY CONSUMPTION IN BUILDINGS SECTOR

Energy consumption in buildings = Urban population X
per capita energy consumption

Where Per capita energy consumption is a factor of per
metre square of floor space as well as application of green
technologies in buildings

The estimations have been done for Delhi, Kolkata and Ahmedabad, and are based on the following assumptions:

- Per capita energy consumption of a person residing/working in a building in a city in India was 2014 KWH per annum (this includes energy used for space heating and cooling, water heating, cooking and lighting in buildings)⁹³ in 2001.
- Energy consumption increases at the rate of increase in per capita income of people⁹⁴.
- Based on discussions with leading architects in

India, it has been determined that the greening of single-family homes would yield energy savings of approximately 15% with current or foreseeable green technologies.

- Densification of buildings has the potential to yield much larger energy savings. This is based on 2 factors:
 1. Energy consumed per capita during the construction of densified buildings is significantly lower than that consumed during the construction of individual homes. This model does not account for energy consumption during construction (i.e. we are being conservative).
 2. Energy consumed per capita from the operation of a building is reduced by approximately

⁹³Nakagami, H. (2006) 'International Comparison of Residential Energy Consumption', Jyukankyo Research Institute Inc., Fig.3, Energy consumption per household by end use

⁹⁴Goldman Sachs(2003), Global economics paper No 99; Dreaming with BRICs: The Path to 2050

30% for a multi-family dwelling (or large commercial blocks) even without applying specifically green technologies. However, integrating green technologies/design with densified buildings yields further energy savings of approximately 10%.

- The population of Delhi in 2001 was 13.8 million. The Delhi government has projected that the population of the city will increase by 3 per cent per annum⁹⁵.
- The population of Kolkata in 2001 was 14.7 million. The Kolkata government has projected that the population of the city will increase by 1.4 per cent per annum⁹⁶.
- The population of Ahmedabad in 2001 was 4.6 million. The Ahmedabad government has projected that the population of the city will increase by 2.6 per cent per annum⁹⁷.

BUSINESS AS USUAL (BAU)	GREENING	GREENING + DENSIFICATION
The current urban form is perpetuated.	Greening of low-density units only. Green codes applied to 40% of potential in 2020 and 80% of potential in 2050.	A deliberate shift towards higher density combined with green codes. Green codes applied to 40% of potential in 2020 and 80% of potential in 2050.

Scenarios:

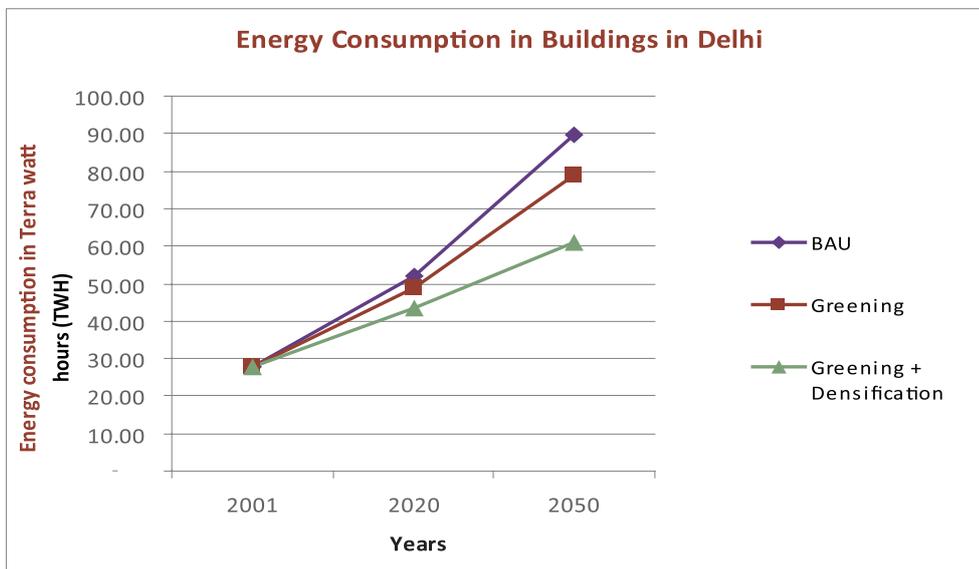


Figure 19: Energy Consumption in Buildings Sector in Delhi

Source: MAPL Analysis

⁹⁵Delhi Statistical Handbook 2006, Directorate of Economics and Statistics, Government of National Capital Territory of Delhi

⁹⁶Kolkata Municipal Corporation, 'Jawaharlal Nehru National Urban Renewal Mission, City Development Plan Kolkata 2006-2012'

⁹⁷Ahmedabad Municipal Corporation and Ahmedabad Urban Development Authority and CEPT University, Ahmedabad, 'Jawaharlal Nehru National Urban Renewal Mission, City Development Plan Ahmedabad 2006-2012'

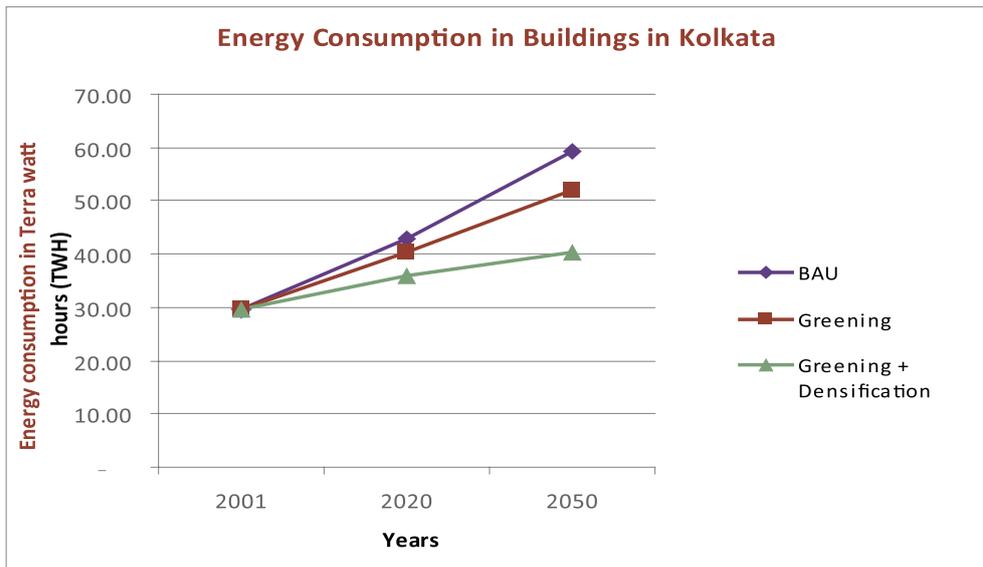


Figure 20: Energy Consumption in Buildings Sector in Kolkata

Source: MAPL Analysis

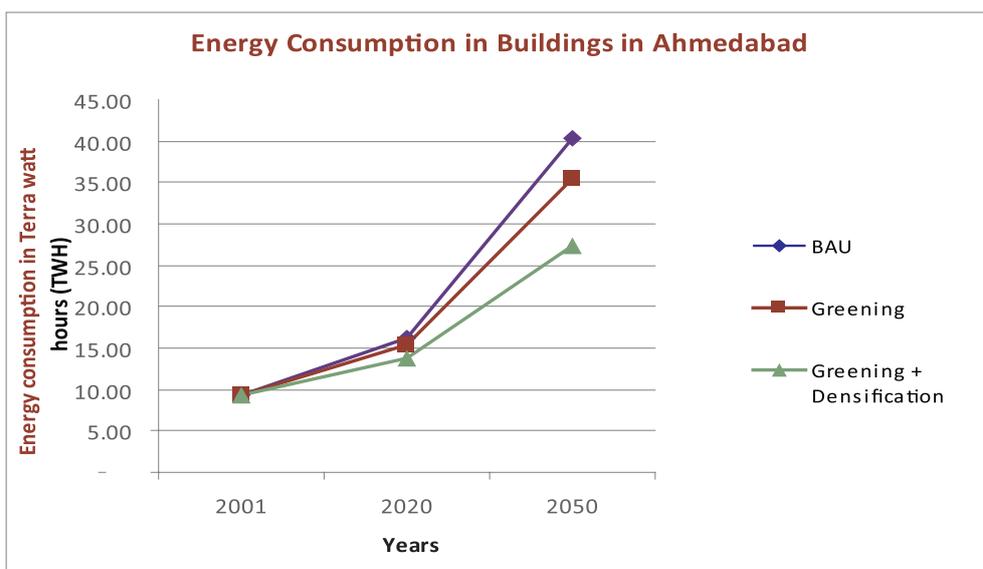


Figure 21: Energy Consumption in Buildings Sector in Ahmedabad

Source: MAPL Analysis

3.4 waste

Urban residents on the whole produce more waste than their rural counterparts. Higher per capita incomes in urban areas translate into higher consumption patterns, and thus higher per capita waste generation. Waste generation is usually expressed as Municipal Solid Waste (MSW)⁹⁸. London and Shanghai generate 11,367⁹⁹ and 14,794 tonnes¹⁰⁰ of MSW per day respectively. In comparison, Delhi and Mumbai generate over 7,000 MSW¹⁰¹ tonnes per day while cities like Bangalore generate 1,742 MSW¹⁰² and Indore 500 MSW¹⁰³ tonnes per day. (See Figure 22)

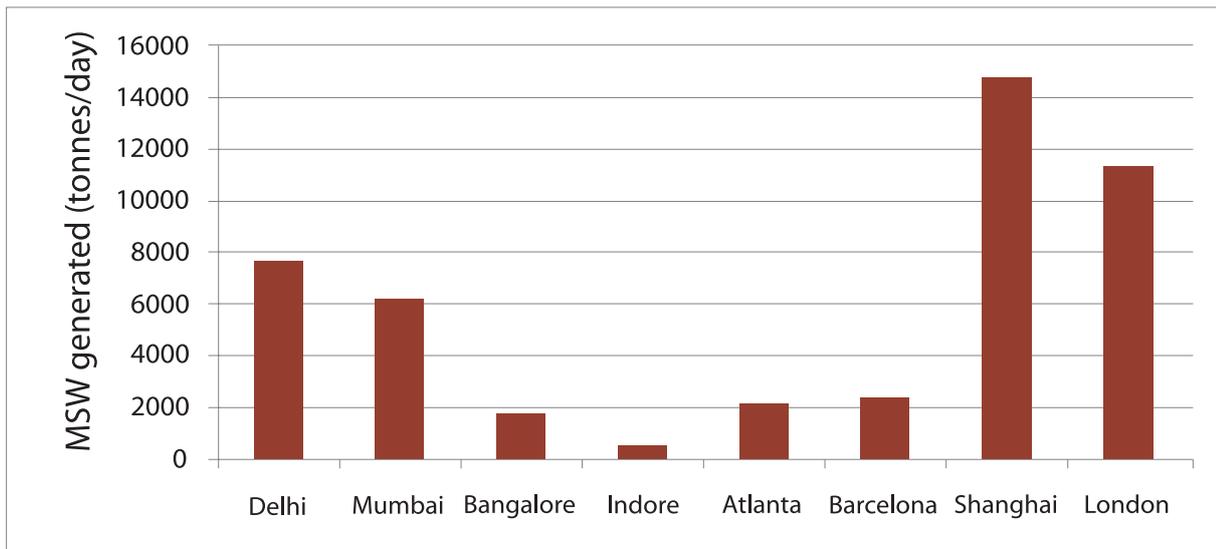


Figure 22: Total Municipal Solid Waste Generation Per Day

Source: MAPL Analysis¹⁰⁴

While Indian cities might generate a lot less waste per capita than their peers, the level is rising. Moreover, Indian cities lag in waste management techniques. In Indore, for example, poor management techniques from collection to transportation to disposal meant that waste collected is dumped approximately 7 km from the city, and 70 per cent¹⁰⁵ of solid waste is disposed off on the streets. This results in a number of undesirable and harmful consequences not just for the environment but also the general health of the city's population. In Delhi, much of the existing dumping sites are now saturated and no new ones have been developed. And whilst treatment facilities are almost negligible, a large share of untreated waste is disposed off in the river Yamuna. An important step in the waste management process is recycling, and in Indian cities much of the recycling is carried out by an informal economy primarily comprising rag-pickers. In Delhi,

⁹⁸Solid waste is defined as any solid material intentionally discarded for disposal, however much of this waste, such as recyclables is valuable to someone else and can be extracted from the waste stream.

⁹⁹Capitalwastefacts.com, 'Londonwide Fact File'

¹⁰⁰World Bank, Urban Development Working Papers, Waste Management in China: Issues and Recommendations (May 2005)

¹⁰¹New Delhi Municipal Corporation, 'Jawaharlal Nehru National Urban Renewal Mission, City Development Plan Delhi, 2006-2012'; Kansal, S., 'Urbanisation And Municipal Solid Waste Management: A Case Study Of Mumbai'

¹⁰²Bangalore Municipal Corporation, 'Jawaharlal Nehru National Urban Renewal Mission, City Development Plan Bangalore, 2006-12', pp 78

¹⁰³Indore Municipal Corporation, 'Jawaharlal Nehru National Urban Renewal Mission, City Development Plan Indore, 2006-2012', pp 43

¹⁰⁴New Delhi Municipal Corporation, 'Jawaharlal Nehru National Urban Renewal Mission, Delhi: City Development Plan Delhi, 2006-2012'; Mumbai: Kansal, S., 'Urbanisation And Municipal Solid Waste Management: A Case Study Of Mumbai', IGDR, Mumbai; Bangalore: Bangalore Municipal Corporation, 'Jawaharlal Nehru National Urban Renewal Mission, City Development Plan Bangalore, 2006-2012'; Indore: Indore Municipal Corporation, 'Jawaharlal Nehru National Urban Renewal Mission, City Development Plan Indore, 2006-2012'; Atlanta: World Bank, Site Resources, Atlanta (United States); Barcelona: Official website of the city of Barcelona, Department of Statistics (2007); Shanghai: World Bank, Urban Development Working Papers, Waste Management in China: Issues and Recommendations (May 2005); London: Capital Waste Facts; Headline Waste Data (2007/2008)

¹⁰⁵Indore Municipal Corporation, 'Jawaharlal Nehru National Urban Renewal Mission, City Development Plan Indore, 2006-2012', pp 43

waste

approximately 100,000-150,000 rag-pickers currently collect 12-15 percent of the 7,700 tonnes of waste generated daily¹⁰⁶. In Mumbai 100,000 rag-pickers collect and sell re-usable waste worth Rs.900 million every year¹⁰⁷. Although the work carried out by the rag-pickers is an important and efficient part of waste management in India, the sector is wholly unorganised and is often based on social exploitation that is not acceptable. Based on the experience of developed countries, the



The Yamuna River Near Delhi

© Jha, V.

World Bank forecasts trends for India and China compared to that of the US. Total municipal waste generation in India is expected to grow from 70 million tonnes in 2000 to 250 million tons by 2030, surpassing that of today's United States¹⁰⁸. Keeping in mind the relationship between economic growth, urbanisation and the generation of waste, developing country cities will have to contend with managing much higher levels of absolute and per capita waste tonnage in the coming years.

3.4.1 transforming waste to energy

Not only can proper waste management save energy, it can also produce additional energy. The following methods can be adopted to achieve this additional energy production:

1. Energy Saving:

Recycling is now globally accepted as the most efficient way of managing waste.

Producing paper, glass, plastics and extracting metals from ores is much more energy intensive than recycling and reusing¹⁰⁹. According to a study by Waste & Resources Action Programme

¹⁰⁶United Nations Habitat Settlement Programme; A Report on 'Urban Environment Waste'

¹⁰⁷Kansal, S., 'Urbanisation And Municipal Solid Waste Management: A Case Study Of Mumbai'

¹⁰⁸World Bank (May 2005), Urban Development Working Papers, 'Waste Management in China: Issues and Recommendations'

¹⁰⁹Sinha, S. (2008), Associate Director; ToxicLinks

(WRAP), up to 95% energy reductions can be achieved from recycling waste materials¹¹⁰.

Recycling also reduces emissions of pollutants that can cause smog, acid rain and the contamination of waterways. In India most of the recyclable waste is collected and recycled by the informal industry. Since there is no information available on how much waste is actually recycled in the city by both the formal and informal sector it is difficult to estimate the energy saving in Delhi as a result of recycling.

Material	% Reduction of energy
Aluminium	95
Paper	40
Glass	30
Steel	60
Plastic	70

2. Energy Production:

The two main options available for energy production from waste are recovery of biogas, and energy by firing of MSW as fuel. The potential electric power generation from Delhi's MSW in 1998 was estimated at 80.13 MW and 30.78 MW respectively at 70 per cent collection efficiency of MSW¹¹¹.

3.5 water

Good water supply and sanitation facilities are essential for the basic functioning of a city. Access to safe drinking water and adequate sanitation can have knock-on effects on improvements in health, increases in incomes and consumption, social and gender inclusion and educational improvements¹¹². However, Indian cities, like many others in developing countries, struggle to provide their citizens with this basic amenity.

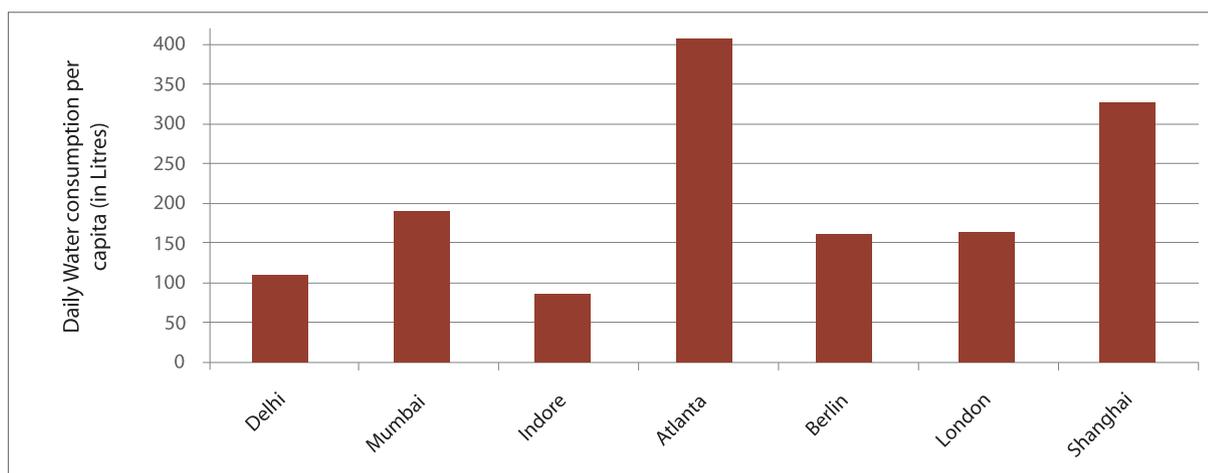


Figure 23: Per Capita Consumption of Water per Day

Source: MAPL Analysis¹¹³

¹¹⁰The Economist (June 2007); 'The Truth about Recycling'; Original Study by Waste & Resources Action Programme
¹¹¹Ramakrishna, V. and Babu, B.V.; Birla Institute of Technology & Science; Energy Recovery From Urban Solid Wastes
¹¹²World Bank (2006), 'A Guide to Water and Sanitation Sector Impact Evaluations', Washington DC
¹¹³Delhi, Mumbai, Indore: Asian Development Bank (2007), Benchmarking and Data Book of Water Utilities in India ; Atlanta: USGS, Science for a Changing World, Rain A Water Resource; Berlin, London, Shanghai: Urban Age, London School of Economics & Political Science, 'Integrated City Making: Transport, Planning & Governance'

water

As seen in Figure 25, the current per capita consumption of water in cities like Mumbai (191L)¹¹⁴ and Shanghai (362L)¹¹⁵ are already far above that in developed country cities such as London (164L)¹¹⁶ and Berlin (162L)¹¹⁷. Again, urban form seems to matter with Atlanta using a lot more water than Berlin and London.

The relatively high consumption rates for India are especially worrying since the supply is erratic and not everyone has regular supply. Note that the problem is not always that of availability. Delhi, for example, has enough water to fulfill the needs of its entire population, but a poor distribution mechanism and an absurdly high rate of leakage means that a significant proportion of its citizens are denied access to water¹¹⁸.

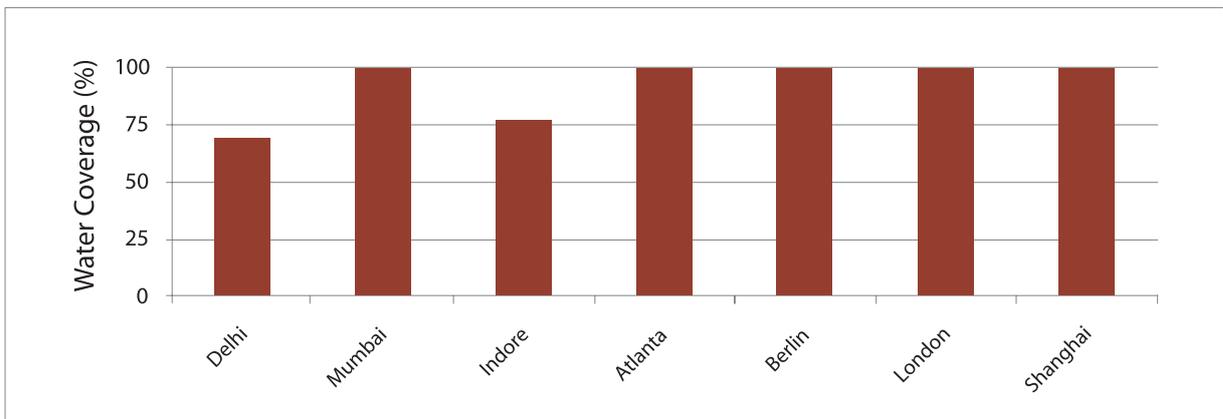


Figure 24: Water Coverage for Select Cities

Source: MAPL Analysis ¹¹⁹

Non-revenue water refers to the amount of water that is lost on the way from production to consumption – owing to leakages, thefts or metering inadequacies. Delhi¹²⁰ and Indore¹²¹ lose about 50 per cent of their water production, whereas Mumbai and Shanghai perform somewhat better with losses at 25 per cent¹²² and 17 per cent¹²³ respectively. However, Berlin has losses at a mere 3 per cent¹²⁴ of its total water production while Singapore not only loses only 2.5% but is able to reuse a lot of the sewage water (called “Newater”). The point is that water scarcity in many Indian cities is not due to the lack of water but the lack of governance and management.

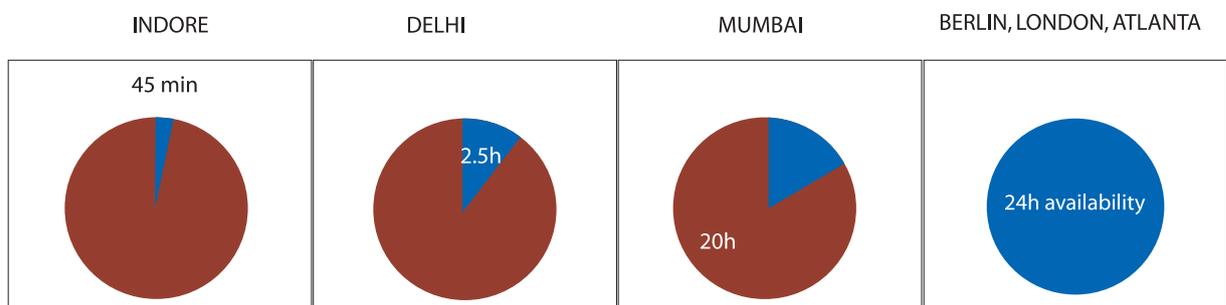


Figure 25: Average Water Availability per Day

Source: MAPL Analysis ¹²⁵

¹¹⁴Asian Development Bank (2007), '2007 Benchmarking and Data Book of Water Utilities in India', pg 79

¹¹⁵Asian Development Bank (2004), 'Water in Asian Cities, Utilities Performance and Civil Society Views'

¹¹⁶Urban Age, London(2006), 'General – Water Consumption'

¹¹⁷Urban Age, Berlin(2006), 'General – Water Consumption'

¹¹⁸WaterAid, Delhi

¹¹⁹Delhi, Shanghai: Asian Development Bank (2004), 'Water in Asian Cities, Utilities Performance and Civil Society Views'; Mumbai, Indore: Asian Development Bank (2007) Benchmarking and Data Book of Water Utilities in India ; Atlanta, Berlin, London: assumed to be 100 per cent

¹²⁰Asian Development Bank (2004), 'Water in Asian Cities, Utilities Performance and Civil Society Views'

¹²¹Indore Municipal Corporation, 'Jawaharlal Nehru National Urban Renewal Mission, City Development Plan Indore, 2006-2012', pp 16

¹²²Municipal Corporation of Greater Mumbai, 'Water Sector Initiatives'

¹²³Asian Development Bank (2004) 'Water in Asian Cities, Utilities Performance and Civil Society Views'

¹²⁴Wittenberg, D., Berlinwasser International (2004), 'Non-Revenue Water Reduction Programme', pp 23

¹²⁵Indore, Delhi and Mumbai: Asian Development Bank (2007), Benchmarking and Data Book of Water Utilities in India; Berlin, London, Atlanta: Urban Age, London School of Economics & Political Science 'Integrated City Making: Governance, Planning and Transport'

3.5.1 water scenario in delhi in 2050

The estimation of a scenario for Delhi in 2050 has been done using the following assumptions:

- Population of Delhi was 13.8 million in 2001,¹²⁶
- Per capita demand of water in 2001 was 110L per day¹²⁷ or 0.00004015 Cubic Metres annually,
- Total production of water in Delhi was 1,044 Million Cubic Metres (MCM) in 2001¹²⁸,
- 45 per cent water is lost due to leakage and no metering¹²⁹,
- Total supply of water = Total water production – Leakage; this amounts to 573.65 MCM, and
- Total water shortage = Total supply – Total demand; in 2003, the supply was 17 MCM in excess of the demand.

Reducing Leakage to 10 per cent	422.415
Waste Water Treatment	200
Water Harvesting	150

Figure 26: Potential for Increasing Supply (Million Cubic Metres)¹³⁰

ASSUMPTION	BUSINESS AS USUAL (BAU)	OPTIMISED	REVOLUTIONARY
Supply of water	Total supply of water remains the same	50 per cent of water leakage opportunity is captured by 2050. 50 per cent of water harvesting opportunity is captured 50 per cent of waste water treatment opportunity is captured	All of water leakage opportunity is captured All of water harvesting opportunity is captured. All of water waste treatment opportunity is captured

¹²⁶Directorate of Economics and Statistics, Government of National Capital Territory of Delhi, Delhi Statistical Hand Book 2006

¹²⁷Asian Development Bank (2007), Benchmarking and Data Book of Water Utilities in India

¹²⁸Asian Development Bank (2004), Water in Asian Cities, Utilities Performance and Civil Society

¹²⁹Ibid.

¹³⁰Soni, V., (November 2003), 'Water and Carrying Capacity of a City: Delhi', Economic and Political Weekly

water scenario in delhi in 2050

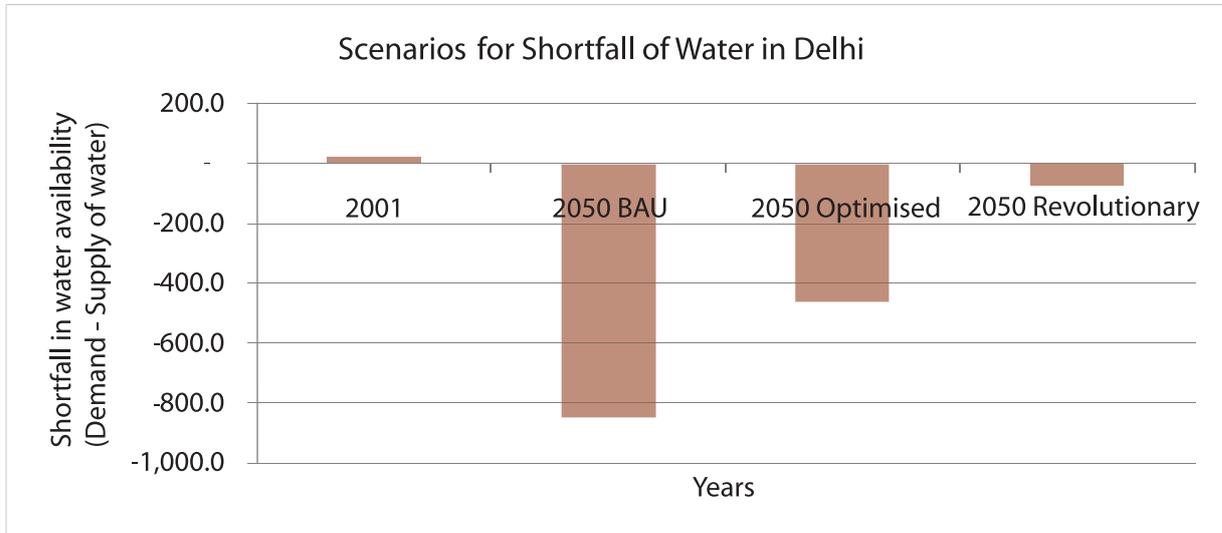


Figure 27: Scenarios for Shortfall of Water in Delhi

Source: MAPL Analysis

Our analysis suggests the fundamental cause of Delhi's water problems lies in governance and management and not in the availability of water. This is true of most of the country's water starved towns. As we will discuss in the next chapter and in the appendix, the problem of governance is a complex one and requires a great deal of attention. If it is not resolved, cities like Delhi will have to rely on increasingly expensive solutions or seriously think about shrinking population. Readers should remember that a previous incarnation of Delhi, the city of Tughlakabad, was abandoned because of water shortages in the fourteenth century. In addition, note that even issues such as water supply and waste management are closely linked to urban form. One of the biggest problems with water distribution and sewage management is the complex systems of piping that need to be maintained. A dense urban form can dramatically reduce the size of the required network. In other words, urban form is not just energy efficiency but also feeds into other aspects of environmental sustainability.

chapter 4

an urban vision for india



4.1 urban form & density

India is at the threshold of rapid urbanisation. As we have seen, the environmental impact of this shift will depend on the particular trajectory of urbanisation that India chooses to take. Since we are still in the early stages of the phenomenon, we may be able to embed “good DNA” into the pattern of urban growth. This requires us to be very clear about the pros and cons of competing strategies. In previous chapters, we have looked at international experience, and at the historical development of existing Indian cities. We have also modeled the long-term impact of different urban choices. The results are clear and unambiguous, and we have listed the three most important ones below. Note that we can get very large gains from better management and application of well-known, existing technology without having to wait for game-changing new technology.

Urban form is a very important factor affecting the ecological impact of an urban system. There are many ways in which density helps limit environmental damage – reducing land use, encouraging people to live in apartments, the clustering of civic amenities and public transportation, supporting walkability and so on. The comparative analysis of different scenarios for transportation and buildings suggests that there are large gains from changing the way we design our cities. However, we found that the largest gains come from increasing density and it works both for transportation as well as for buildings. For instance, more than half the gain from creating “green design” can come simply from moving people from single family homes to apartments rather than through specific “green codes”. At the same time, density is a pre-requisite for allowing public transport and walking to be used as the main forms of transportation. The implication is clear; we need to plan for density. Applying green building codes on individual buildings is important and necessary but they cannot compensate for the large gains made from changing overall urban form. As we saw in Chapter 1, this is the crucial difference between the “Barcelona trajectory” and the “Atlanta trajectory”.

Of course, density does not mean that city planners blindly squeeze a lot of people and real estate into a small space. It requires thinking about creating the soft and hard infrastructure that can support such concentration. For instance, public spaces become very important in order to provide space to people to interact and/or get relief from the strains of dense living. Manhattan would not be successful as an urban space but for Central Park. Unfortunately, post-independence urban planning in India has either ignored density or deliberately discouraged it. This has either led to sprawls or even worse, densification without the supporting infrastructure. Mumbai provides a good example of both.

In the 1960s and 1970s, city planners decided that Mumbai’s population should be controlled at about 7 million. Land regulation and infrastructure policies were designed accordingly. However, people flooded into the city anyway and today the city is more than twice the intended size, with the highest population density of any metropolitan area in the world. Yet, the policy response was not to try and support this density but to legislate it away. Floor Space Index (FSI)¹³¹ regulations in Mumbai were introduced in 1964 stipulating the maximum building space for every square metre of the plot of land. It was set at 4.5. Almost all buildings in Mumbai with a legal FSI exceeding 4.5 were built before 1964.

¹³¹FSI is the ratio of the total floor space in a building to the area of the plot on which it is built. For example, suppose a building covers half of a plot that is 1,000 square metres in size and if the building has 10 floors, it exhibits an FSI of 5.

climate change calls for a different urban form, not slower urbanisation

Urbanisation is associated with industrialisation, which increases emissions of carbon dioxide (CO₂) and other greenhouse gases. And increasing wealth tends to be associated with higher energy consumption, for instance through motorisation. But to be concerned about the climate does not mean that urbanisation should be slowed. If anything, economic density may need to be encouraged even more.

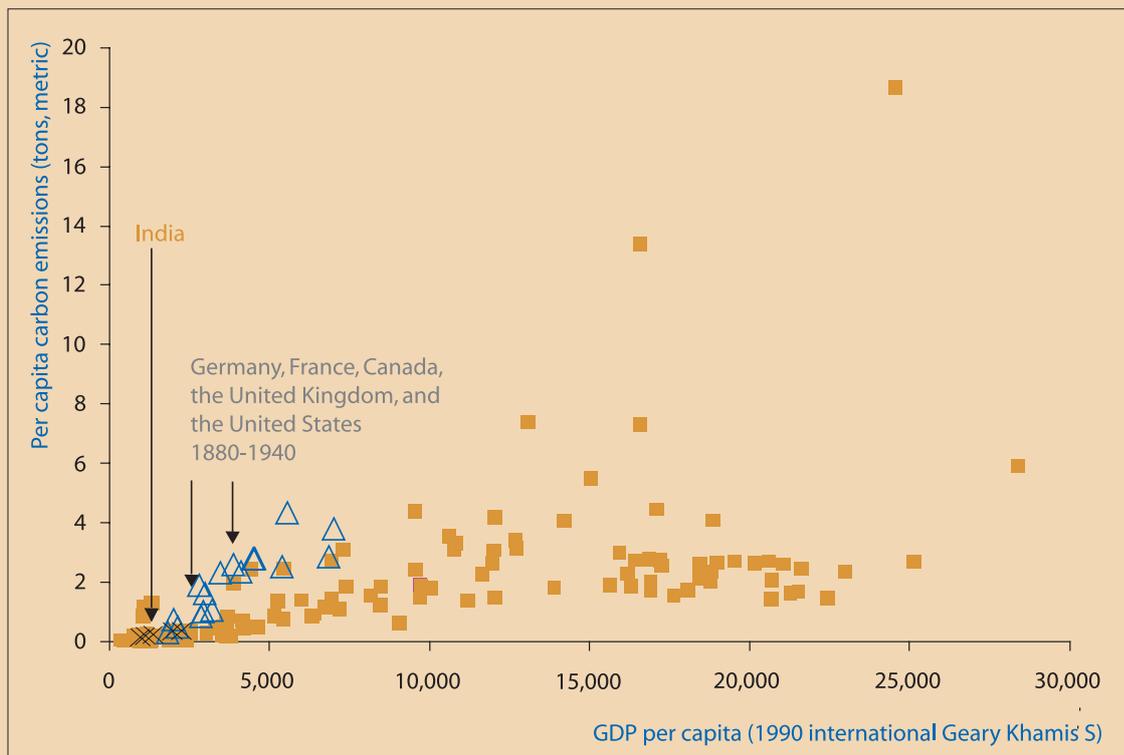


Figure 28: Countries can change their energy trajectories; India has the option to adopt a low carbon development trajectory

Source: Oak Ridge National Laboratory, US Department of Energy

Historical data going back to the nineteenth century shows that today's rich countries experienced rising per capita carbon emissions as they urbanised and industrialised through the twentieth century¹³². Industrialisation, motorisation, and consequently carbon emissions in developing countries follow the trajectories of developed countries in their earlier stages of development¹³³. For instance, per capita carbon emissions in Germany doubled from 0.8 metric tons of carbon in 1880 to 1.6 in 1900. In the United States and the United Kingdom, carbon emissions were about 2.5 in 1900. Today's developing countries have lower average emissions at the equivalent GDPs per capita of Germany, the United Kingdom, and the United States in 1880 and 1900. Botswana's carbon emissions were 0.36 per capita in 1987 and 0.57 in 1996.

¹³²World Bank, World Development Report (2009), 'Reshaping Economic Geography', originally sourced from Marland, Boden, and Andres (2007)

¹³³World Bank, World Development Report (2009), 'Reshaping Economic Geography', originally sourced from World Bank 2002, figure 2.1; Lanne and Liski 2003, figures 1, 4, and 5; and data in developing countries from <http://cdiac.esd.ornl.gov>

urban form & density

The trend in most developing countries suggests continuing growth in carbon emissions both in total and per capita. The policy response to projected increases in urbanisation and carbon emissions in developing countries should not attempt to prevent growth of cities. This would not be feasible or desirable in light of evidence on growth and poverty reduction. Instead, growth in cities—many of which might double in size over the next few decades—should be managed to create urban areas far more carbon efficient than many of today's mature cities.

Monocentric structures and high population densities tend to reduce the length and number of motorised trips¹³⁴. Compact cities use less energy for transport, consume less land for housing, and use less energy for heating. Several studies find that high population density is negatively correlated with carbon emissions¹³⁵. At the national level, Sweden and Japan have used incentives and regulation to greatly reduce the emissions intensity of their economies. At the urban level, an emphasis on density and smart choices that reduce distance can help do the same. This requires land use policies that favor compactness and transport policies that guide urban form and provide convenient and efficient public transit¹³⁶.

Atlanta and Barcelona illustrate alternative urban growth scenarios. They had similar populations of 2.5 million to 2.8 million, but Atlanta had a density of six people per hectare in 1990, and Barcelona had 176¹³⁷. In Atlanta the longest possible distance between two points within the built-up area is 137 kilometres; in Barcelona, the distance is only 37 kilometres. Per capita CO₂ emission was 400 metric tons in Atlanta, 38 tons in Barcelona¹³⁸. Atlanta's metro network is 74 kilometres long, but only 4 percent of its population is within 800 meters of a metro station. Barcelona's metro network is 99 kilometres, and 60 percent of its population lives within 600 meters of a metro station. Only 4.5 percent of trips are by mass transit in Atlanta, a fraction of the 30 percent in Barcelona. For Atlanta to achieve Barcelona's metro accessibility would require building an additional 3,400 kilometres of metro tracks and about 2,800 new metro stations. This would allow the Atlanta metro to transport the same number of people that Barcelona does with only 99 kilometres of tracks and 136 stations.

Density makes the difference.

Source: World Bank¹³⁹

The standard practice in cities with limited land is to raise the permitted FSI over time to accommodate urban growth, as in Manhattan, New York; Singapore; Hong Kong and Shanghai. Instead, the Municipal Corporation of Greater Mumbai went the other way, lowering the permitted FSI to 1.33 in 1991. Under the rules that existed until recently, new buildings, including those in the Central Business District, were subject to FSI of 1.33. The result is that density is now being achieved though unauthorised construction, slums and extreme compromises in the availability of built-up space per capita. World Bank estimates indicate that 54 percent of Mumbai's 16 million people now live in slums and another quarter in degraded apartments.

This last point is very important to understand. Most people tend to think that Indian cities are already too dense. This is because they are confusing density of population with density of built-

¹³⁴World Bank, World Development Report (2009), 'Reshaping Economic Geography', originally sourced from Bento and others (2003)

¹³⁵World Bank, World Development Report (2009), 'Reshaping Economic Geography', originally sourced from Scholz 2006; Vance and Hedel 2006; Golob and Brownstone (2005); Ingram (1997); International Union of Public Transport

¹³⁶World Bank, World Development Report (2009), 'Reshaping Economic Geography', originally sourced from Bento and others 2003; Scholz 2006; Vance and Hedel (2006); Golob and Brownstone (2005)

¹³⁷World Bank, World Development Report (2009), 'Reshaping Economic Geography', originally sourced from Bertaud (2004)

¹³⁸World Bank, World Development Report (2009), 'Reshaping Economic Geography' originally sourced from Kenworthy (2005)

¹³⁹World Bank, World Development Report (2009), 'Reshaping Economic Geography', Box 7.6 pg. 211, original source of graph: Oak Ridge National Laboratory, U.S. Department of Energy at http://cdiac.esd.ornl.gov/ftp/ndp030/nation.1751_2004.ems; Lanne and Liski 2003

up space. As Jane Jacobs puts it in her classic book *The Death and Life of Great American Cities*: “One reason why low city densities conventionally have a good name, unjustified by the facts, and why high densities have a bad name, equally unjustified, is that high density of dwellings and overcrowding of dwellings is often confused”¹⁴⁰. A city like Mumbai is certainly very dense from a population perspective but this density is being achieved through an inhuman compromise of space and quality of life. Yet, there are large tracts of space in Mumbai – such as the 22km of derelict Port Trust land along the eastern shore – that lies unused. Yes, even Mumbai can support more built-up space if it is properly redesigned.

4.2 public transport & walkability

Public transport systems are important because of the direct impact they have on energy use. Our scenario analysis clearly demonstrates the impact a shift in modal split in favour of public transport can have on the trajectory of energy use. Importantly, note that the transport infrastructure also has a long-term impact on the embedded DNA of a city and development of urban form. We saw in Chapter 2 how the development of Mumbai, Delhi and Kolkata was profoundly affected by the transport backbones created for them. Thus, density and public transport systems are closely linked.

Public transport systems range from buses to underground railways, but we would like to draw special attention to the issue of walkability. As discussed in detail in Chapter 3, walking is a form of transportation that is almost entirely neglected by urban planners in India. This is unfortunate because it is not just the least ecologically damaging form of transportation but it is a critical strategic enabler for other public transport systems to function effectively. Furthermore, it has large positive externalities from social and economic perspectives – it is socially equitable, promotes community/social cohesion, improves health and can give the city a “buzz” factor.

In short, we strongly recommend investing in walkability. We feel that such a strategy will be met with very positive public response because studies show that a very large proportion of urban Indians already walk despite the poor pedestrian infrastructure. As discussed earlier, a 2008 study of 30 Indian cities¹⁴¹ showed that almost 40% of all trips in urban India involved no motorised vehicles at all – 28% walked and 11% cycled. The proportion was sharply higher in smaller towns since distances were usually small and the roads less congested. However, in bigger cities, the proportion of people using conventional public transport was high, and consequently commuters walked the last mile. For instance, in cities with more than 8 million population: 22% walked all the way, 8% used cycles and 44% used public transport. This adds up to 74% of people who rely on non-motorised transport for at least part of the commute.

Note that walkability and public transport must be embedded in urban DNA as soon as possible because it is very difficult to retrospectively change urban form. As discussed in the box above,

¹⁴⁰The Death & Life of Great American Cities, Jane Jacobs, Random House 1961

¹⁴¹“Traffic and Transportation Policies and Strategies in Urban areas in India”, Wilbur Smith Associates (sponsored by Ministry of Urban Development), 2008.

public transport & walkability

Atlanta has a metro network of 74km while Barcelona has one of 99km. These may seem comparable but per capita CO₂ emissions for Atlanta are ten times that of Barcelona. The difference is mostly explained by Barcelona being compact while its American rival is spread out. As a result, less than 4% of Atlanta's population lives within a reasonable walking distance of a metro station compared to 60% for Barcelona. If Atlanta now tried to give its citizens the same accessibility, it would have to build 2800 new metro stations and 3400km of new tracks!¹⁴²

Despite this overwhelming evidence, very little thought is given to pedestrians in Indian urban planning. A brand new city like Gurgaon does not have any network of sidewalks at all! Note that it is not just a matter of building sidewalks. "Walkability" is about making it possible for the average citizen to be able to lead his/her life by relying largely on walking for day-to-day activities. This requires a whole gamut of urban design requirements like density, mix-use, street life, pedestrian crossings, tree-shade, public-spaces and so on. All these parameters are important in their own right but walkability is a simple way of encapsulating this philosophy of urban planning. This is why we strongly recommend walkability as the single most important urban design paradigm that must be adopted while thinking of India's urban future.

4.3 the need for an integrated but evolving framework

As the reader may have realised, many of our recommendations are closely interlinked. Walkability, for instance, is closely linked with density, urban software, social equity, and with the need to revive small towns. Furthermore, we are very conscious that an environmentally sustainable city will only work if it is also socially and economically vibrant. The Mirabilis Matrix is a simple analytical framework for bringing all these aspects together. It provides a way to think about how different elements - Hardware, Software, Urban Governance, Liveability, Competitiveness and Environmental Footprint - come together to form a successful city. This is not a priority list but a way to think about how a successful city comes together by combining different ingredients. Successful urban planning is about organically combining these facets. This is not a "mechanical" approach but one that explicitly thinks of the city as an evolving eco-system.

The Horizontals

Liveability:

At the most fundamental level, cities are meant to be lived in. To succeed, they must be pleasant places to live, work and play for a large cross-section of the society. Hardware, software and governance are all important factors that define liveability. There is no set formula for how these ingredients combine to make a city liveable. Different cities have evolved different recipes that fit the particular needs of particular societies.

¹⁴²World Development Report 2009, The World Bank.

	HARDWARE	SOFTWARE	GOVERNANCE
LIVEABILITY	Good quality housing and amenities like parks, hospitals, clubs and schools	Social networks & interaction. Clustering of amenities to create "urban buzz", a sense of place and history	Safety and enforcement of Law. Simple and well enforced system of municipal regulation
ECONOMIC COMPETITIVENESS	Transport and communication links. Quality of office/commercial space	Clustering of human capital and ability to attract talent, socio cultural openness	Reasonable tax rates. Efficient governance structures
ENVIRONMENTAL FOOTPRINT	Public transport, density, green spaces, waste management	Environmental consciousness, low impact lifestyles	Air and water quality. Sustainable practices with regard to water supply & usage

Figure 29: The Mirabilis Matrix: An Analytical Tool for Urban Thinking

Source: MAPL Research

Economic Competitiveness:

For time immemorial, cities have competed for influence, power and commerce. In the nineteenth and twentieth centuries, this often meant growing and harnessing their industrial prowess. In the twenty-first century, however, cities will compete in terms of their ability to bring in human capital. Rather than lead to the dispersion of economic activity, the telecommunication revolution appears to have increased the value of clusters of human capital. Thus, London and New York have emerged as global cities while university towns like Boston, San Francisco-Bay Area, Oxford and Cambridge (UK) have witnessed extraordinary revival.

Environmental Footprint:

More than half of the world's population now lives in urban areas. India too is likely to be urbanised very quickly over the next few decades. There is a need to consider the environmental costs and benefits of this shift. A conscious effort will be required to design dense cities with public transport systems and sustainable energy, air and water practices.

The Verticals

Hardware:

This includes all the residential/commercial buildings, roads, theatres, museums, stadiums, airports and so on that constitutes the physical form of a city - the material manifestation of the city. Clearly these are very important but, in India, all urban thinking and planning seems sometimes to be limited only to this aspect.

Software:

This relates to all the activities that people conduct in the urban space. This includes economic activities as well as socio-cultural interactions that give a city its life. To provide an analogy, as a computer's

public transport & walkability

hardware must allow the software to function correctly, a city must provide adequate physical infrastructure to enable its citizens to perform well. Grand and expensive projects do not always create great cities if they do not actively engage with the lives of the citizens.

Governance:

Cities are complex systems and they require constant regulation/management in order to function efficiently. Rules must be rational and their enforcement must be visible and even-handed. Very little thought is given to this aspect in India even in its major cities. Gurgaon, for instance, is still run as if it was a small *moufassil* town, even as different promoters create a random mix of management systems for their individual developments. There is no consistent set of municipal rules or a transparent system for enforcement.

4.4 the problem of municipal governance

A major problem for urban India is the generally poor quality of governance and services. We have seen in Chapter 3 how absurdly high rates of transmission losses and pilferage are a major cause of water shortages in cities like Delhi (a loss of around half the water). This is also true of a number of other areas including power supply. Poor governance affects everything from traffic flows and sewage treatment to unauthorised construction. If municipal management is poor in the larger cities, it is even worse in the smaller towns. This has been a major reason why small town India went into decline in post-independence India. Poor municipal governance comes at a huge cost to urban sustainability. Take for example, transmission losses from the power grid. Frequent power outages have meant that much of urban India relies on back-up from diesel generators and battery inverters. This is very inefficient and environmentally harmful. It is not possible to “model” the challenge of urban governance but readers must remember that any solution for India’s many urban problems must deal with this issue.

So what is the solution? There are many complex reasons for poor urban governance. However, we feel that two things need to be sorted out at the very least.

First, the institutional structure of urban governance must be simplified and cleaned up. Currently, there is a confusing multiplicity of agencies that manage the cities. A stylised rendition of Delhi’s governance structure is shown in the chart below (for other cities see Annexure 1). As one can see, it involves the national government, the state government and local government. This structure needs to be urgently rationalised.

Second, the municipal laws that govern our cities need to be comprehensively revisited and then

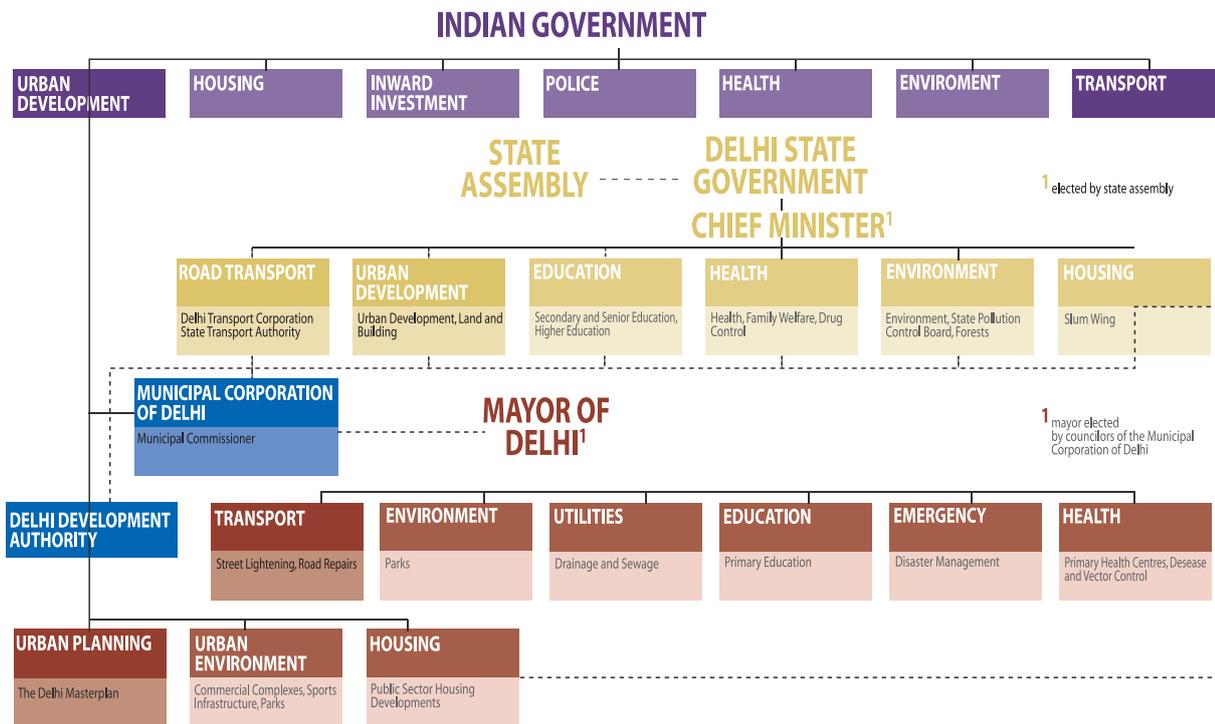


Figure 30: Delhi's Governance Structure

© Urban Age, London School of Economics, www.urban-age.net

enforced. In the single area of green building codes, we have at least three sets of rules: the Energy Conservation Building Code constituted by the Indian Bureau of Energy Efficiency, a body under the Ministry of Power; the National Building Code of India 2005 constituted by the Bureau of Indian Standards, a body under the Ministry for Consumer Affairs; and Green Rating for Integrated Habitat Assessment (GRIHA), created by TERI, a well-known NGO, and supported by the Ministry of New and Renewable Energy. Of course, many Indian builders also use international standards such as the LEED. Surely, urban governance would benefit enormously by merely providing a clear set of rules. The good news is that Indians respond positively and quickly when presented with sensible rules that are enforced even handedly. We have many examples of this ranging from rain-water harvesting codes in Chennai to the wearing of seat-belts in Delhi.

4.5 strategic interventions versus masterplanning

Our argument for an “integrated” approach to urban planning may be misconstrued as an argument for traditional masterplanning. However, masterplanning has a dismal history in India. This should not be a surprise given the problems with governance discussed in the earlier section. Even the national capital has been unable to implement a master-plan despite repeated efforts.

According to the Delhi District Gazetteer 1883-84, Delhi had a population of 173,303 in the late nineteenth century. The grandeur of the Mughal court was long forgotten and, after 1858, it was no more than a large provincial town. That changed when the British colonial government decided to shift the capital to Delhi in 1911 and hired Edwin Lutyens to design a city to reflect imperial grandeur. Lutyens’ created what is effectively the first “masterplan” for New Delhi. It was meant for a population of 60,000 – mostly government officials and their retainers. The old city was still expected to remain the commercial hub.

Lutyens’ Delhi was completed in the mid-thirties but the urban plan collapsed barely a decade later as the city found itself with hundreds of thousands of refugees fleeing West Pakistan. The authorities dealt with the crisis with ad-hoc arrangements but in 1962, a new master-plan was devised. Given the thinking of the times, it was a framework for low-rise suburbia where the government would decree land-use and zoning. From their “commanding heights” the planners declared that “there is undesirable mixing of land-uses almost everywhere in the city.” Just as the government has the right to control economic activity through licenses, it also has the right to tell people where to live and where to work.

The 1962 master plan was a dismal failure. The city developed in unpredictable ways while the government failed to deliver on many promises. Even by 1981, only three of fifteen district centres proposed in the masterplan had been developed. Offices, clinics and shops moved into residential areas as the designated commercial areas were grossly insufficient. Even by 1992, with the population now at 9 million, only six of the fifteen district centres were developed. Liberalisation created economic opportunities that pushed the gap between plan and reality to breaking point. Eventually the pressure

...IN A RAPIDLY EVOLVING URBAN ENVIRONMENT IT IS NEAR IMPOSSIBLE AND PROBABLY COUNTER-PRODUCTIVE [TO MAINTAIN A MASTERPLAN]...IT MAY BE EASIER TO IDENTIFY SIMPLE DESIGN PARADIGMS THAT ENCAPSULATE THE OVERALL STRATEGY AND THEN IMPLEMENT THEM THROUGH STRATEGIC INTERVENTIONS THAT HAVE MULTIPLIER EFFECTS

exploded into brand new areas like Gurgaon and Noida. The official response was yet another master-plan announced in 2007 called Delhi 2021. Two years later it already looks outdated.

The most obvious problem with masterplanning in Indian cities is the lack of governance. The civic authorities simply do not have the ability to enforce the master-plan even in the national capital. Secondly, all master-plans require proper implementation and sequencing of public investment. As discussed earlier, a combination of corruption and incompetence meant that important aspects of the 1962 master-plan remain unimplemented even today. There is, however, a more fundamental flaw with the whole masterplanning approach. It cannot deal with organic evolution of a living and vibrant city. There was no way in which Lutyens could have predicted Independence and Partition in 1913 and the 1962 master-plan could have anticipated Gurgaon's BPO boom.

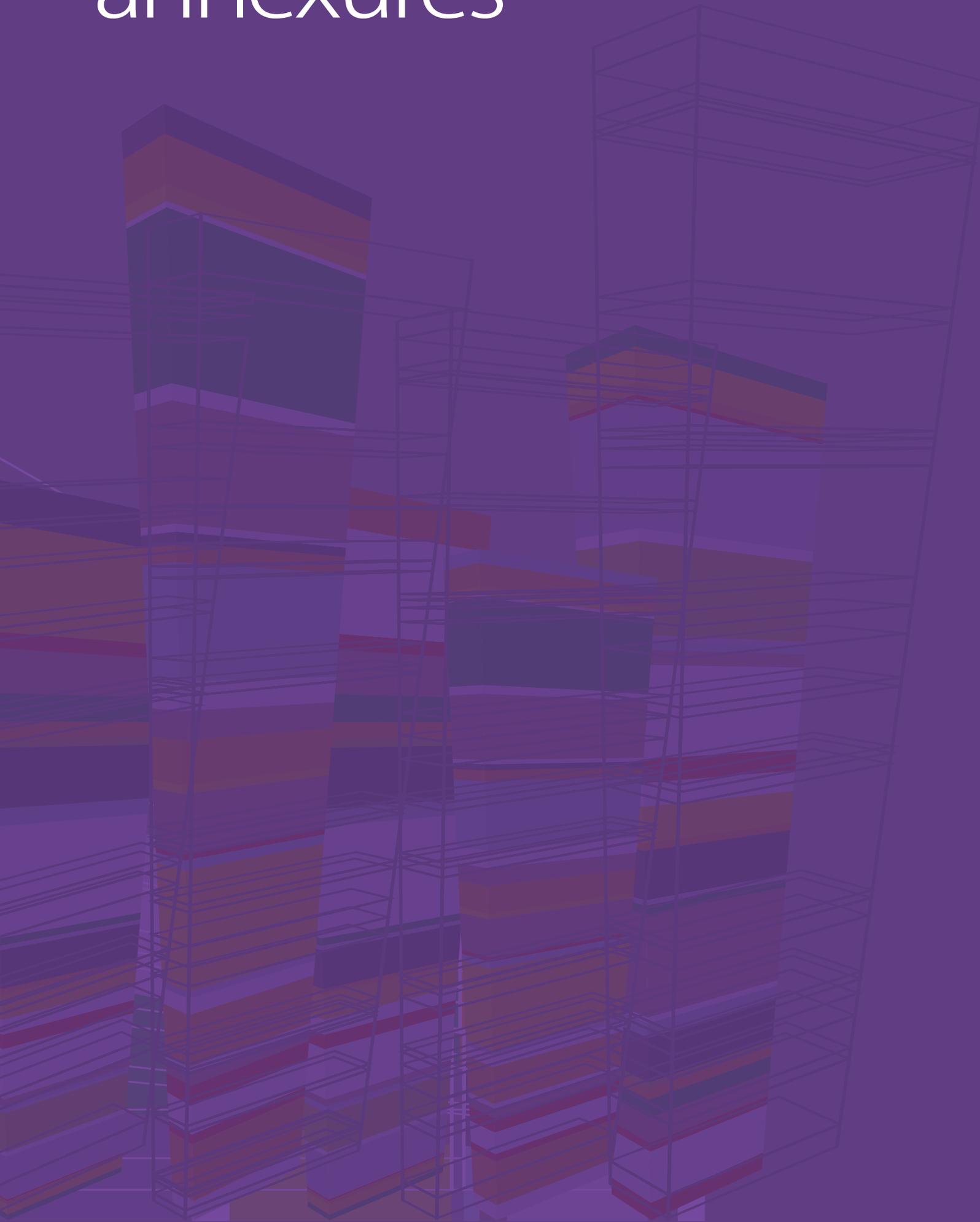
Indeed, masterplanning has failed in most cities in the world. Singapore is one of the few exceptions but, even in this case, success has been mostly due to the Singaporean government's unique ability to think strategically and to adjust the model constantly. India lacks the technical, administrative and political capability needed for continuous policy risk-taking. So what is the alternative? In our view, the governments who run the National Capital Region should concentrate on two things – basic governance and a few strategic interventions.

Our criticism of masterplanning does not mean that we are advocating a free-for-all. Even in a market economy, the State is needed to provide basic governance and public goods. Thus, the NCR needs a simple set of municipal rules regarding property rights, traffic, street-hawking, advertising signage and so on. The government should concentrate on enforcing these rules. Similarly, the authorities should worry about parks, public health, sewage disposal and other public amenities. The government should not be concerned about whether or not an up-market restaurant should be allowed in an abandoned mental asylum in Mehrauli.

Of course, the government will, from time-to-time, need to make large strategic interventions in order to cut through intractable gridlocks in the urban eco-system. However, these should strictly be interventions that will open out new urban vistas and have large multiplier effects. The Delhi Metro is an example of such a strategic investment that was necessary to get away from Delhi's reliance on roads. The Metro is changing the urban eco-system of Delhi in unpredictable ways, but that is the idea. Another intervention in the same vein is the proposal to clean Delhi's 300km network of nullahs and turn them into a network of walking paths criss-crossing the city. This would dramatically improve the last-mile connectivity of public transport, encourage walking for short trips and enable social interaction; not to mention improve drainage and sewage disposal. This is a cheap and simple intervention but has the potential to fundamentally change Delhi's DNA. Again, the exact outcome is not pre-determined but it opens up a whole new way for Delhi to evolve (interested readers can visit: www.delhinullahs.org).

To conclude, it is very difficult to maintain a master-plan in the best of times but in a rapidly evolving urban environment it is near impossible and probably counter-productive. This does not mean that India abandons all effort to guide its future urban trajectory. Instead, it may be easier to identify simple design paradigms that encapsulate the overall strategy and then implement them through strategic interventions that have multiplier effects. In this report, we have identified density, public transport and more specifically walkability as the paradigms for India's urban future.

annexures



1 urban governance in india

history

Municipal governance in India was first introduced in 1687 when the Madras Municipal Corporation was formed, followed by the creation of the Calcutta Municipal Corporation and the Bombay Municipal Corporation in 1726. In 1850, the Improvements in Towns Act was passed by the Government of India that established a system of councillors and gave them administrative authority. Subsequently, Lord Mayo's Resolution of 1870 instituted the system of city municipalities and called for the introduction of an elected president to lead them.

In 1882, Lord Ripon's Resolution of Local Self-Government created the outline and structure of municipal governance in India. It introduced a two-tier system of governance to increase governance efficiency through decentralisation of functions. Based on the 1918 Montague-Chelmsford Report, the Government of India Act 1919 introduced the system of 'Dyarchy', where power-sharing arrangements between the state and the local bodies differed, but conformed to the same organisational pattern.

The District Municipalities Act of 1920 transformed the Municipal Councils into elected bodies and granted them powers to flesh out their own budgets. The Government of India Act 1935 brought local government within the purview of the state or provincial government and granted them enhanced powers¹⁴³.

the 74th constitution amendment act, 1992¹⁴⁴

Prior to 1992, Indian local governments did not have a constitutional status but only a statutory status under state law. Therefore, the governance of urban areas was directly under the control of the state government. This changed with the enactment of the 74th Constitution Amendment Act, 1992. For the first time in the history of urban governance, Urban Local Bodies (ULBs) were granted a constitutional position as the third tier of government.

These bodies were given a constitutional outline for conducting regular elections, powers and financial devolution. The Amendment assigned local bodies with the responsibility of providing basic services.

Urban Local Bodies (ULBs) are classified depending on the population:

- Nagar Panchayats: for 'rurban' areas
- Municipal Councils: for smaller urban areas
- Municipal Corporations: for metropolitan areas

"In many States local bodies have become weak and ineffective on account of a variety of reasons, including the failure to hold regular elections, prolonged supersessions and inadequate devolution of powers and functions. As a result, Urban Local Bodies are not able to perform effectively as vibrant democratic units of self-government."

74th Constitution Amendment Act, 1992

¹⁴³First State Finance Commission Report (1996), Government of Tamil Nadu; Cross, Cecil Merne Putnam (1922), 'The Development of Self-Government in India 1858-1914', University of Chicago Press, Chicago

¹⁴⁴Also known as the 'Nagarpalika Act'; for full text see <http://indiacode.nic.in/coiweb/amend/amend74.htm>

urban governance in india

Municipalities were designed to incorporate elected representatives, experts and the Municipal Chairperson. They were awarded a five-year term with re-election scheduled for within 6 months of dilution. Towards this, a state-level Election Commission was established.

The 74th Constitution Amendment Act also sought to institute the Directive Principle of decentralisation in the urban context¹⁴⁵. ULBs were granted powers and responsibilities in terms of preparation of plans, implementation of development schemes, and administration of taxes. A state-level Finance Commission was established to review the finances of ULBs falling within its purview.

In addition to these three tiers of local government, two other important organisational structures -- the District Planning Committee and the Metropolitan Planning Committee¹⁴⁶ -- have been created under the Constitution. The 74th Constitution Amendment Act also added the 'Twelfth Schedule' to the Constitution. The Schedule (Article 243W) enumerates the functional responsibilities that the municipalities are meant to shoulder.

Today, there are around 3,700 ULBs with 100 municipal corporations, 1,500 municipal councils and 2,100 Nagar Panchayats, besides 56 cantonment boards¹⁴⁷. While these figures might be indicative of a decentralising policy environment, a cursory survey of contemporary city-level institutions throws light of how much ground is yet to be covered.

A study by a prominent research institute in Delhi assessed the impact of the 74th Constitution Amendment Act in twenty-seven states and one union territory. It concluded that, "...municipalities in India are confronted with a number of problems, such as inefficiency in the conduct of business, ineffective participation by the weaker sections of the population in local governance, weak financial condition, lack of transparency in the planning and implementation of projects, etc., which affect their performance adversely¹⁴⁸."

divisions of powers - elected, nominated and administrative

The 74th Constitution Amendment Act provides the outline for elected and nominated councillors. The number of elected councillors varies according to the population of an area. Nominated councillors are to be selected by the elected councillors for their expertise in municipal administration. However, they are not granted voting rights.

the municipal corporation - organisational structures

The 74th Constitution Amendment Act does not specify any specific organisational structure for municipal administration in India. This is an issue for state legislation and the structure differs from state to state.

¹⁴⁵Article 40 of the Constitution states that, "The State shall take steps to organise village panchayats and endow them with such powers and authority as may be necessary to enable them to function as units of self government." While the 73rd Constitution Amendment Act addressed decentralisation of governance in rural areas through the Panchayati Raj system, the 74th Constitution Amendment Act applies this principle in the urban areas

¹⁴⁶The District Planning Committee is meant to consolidate development and growth plans for both rural and urban areas falling in its jurisdiction to create a comprehensive development plan for the district. Similarly, the Metropolitan Planning Committee is meant to create a development plan for the metropolitan area falling in its purview. See Article 234ZD and 243ZE of 74th Constitution Amendment Act

¹⁴⁷A kind of extra-constitutional body

¹⁴⁸'Impact of the Constitution (74th Amendment) Act on the Working of Urban Local Bodies (Volume I)' (2005), National Institute of Urban Affairs, Delhi

The Ministry of Urban Development drafted a Model Municipal Law, 2003 which was circulated to state governments. The rationale for the lack of a centrally administered Municipal Model is that local bodies need to be flexible to respond better to local requirements¹⁴⁹. As detailed below, two broad models are commonly in use.

*commissioner system*¹⁵⁰

mayor

The Mayor in the Municipal Corporation is typically chosen through indirect elections by the councillors among themselves, for a term of one year which is renewable. The Mayor does not have executive authority. Councillors and Committee Councillors act as a committee. The most powerful committee is the standing committee, which functions as the steering board exercising executive, supervisory, financial and personnel powers. It is composed of elected members varying in number between seven and sixteen through a system of proportional representation of councillors.

the executive

The Municipal Commissioner acts as the Chief Executive Officer and head of the executive arm of the Municipal Corporation. All executive powers are vested in the Municipal Commissioner. The powers of the Commissioner are provided by the statute and delegated the Standing Committee.

*mayor in council model*¹⁵¹

This form of city governance is similar to a cabinet government and follows the framework of state and national governments. This model consists of a Mayor and a cabinet, with individual portfolios, chosen from among the elected councillors. The Municipal Commissioner acts as the Principal under the supervision of the Mayor who is the Chief Executive Officer.

governance structure of cities: the reality

The above “model” structure may seem relatively simple, but in reality urban governance is a confusing mix of multiple agencies. Some are new while others are legacies of older regimes; some are answerable to local government while others to state level or even national government.

The following charts have been sourced from the Integrated City Making report (2008) of Urban Age, London School of Economics and Political Science. They are illustrative of how government structures are organised in cities and how transport and spatial planning powers are assigned. They are intentionally designed to give a crude impression of how the basic patterns of responsibilities are organised

¹⁴⁹ Model Municipal Law, 2003

¹⁵⁰ As seen in Mumbai

¹⁵¹ As seen in Kolkata

urban governance in india

within each of these cities, identifying some of the key functions carried out at central, state and local government level. While they offer a useful comparative overview they are not intended to give an accurate account of the detailed systems of accountability which can only be explained comprehensively on a case-by-case basis. We have also shown London to provide an international comparison.

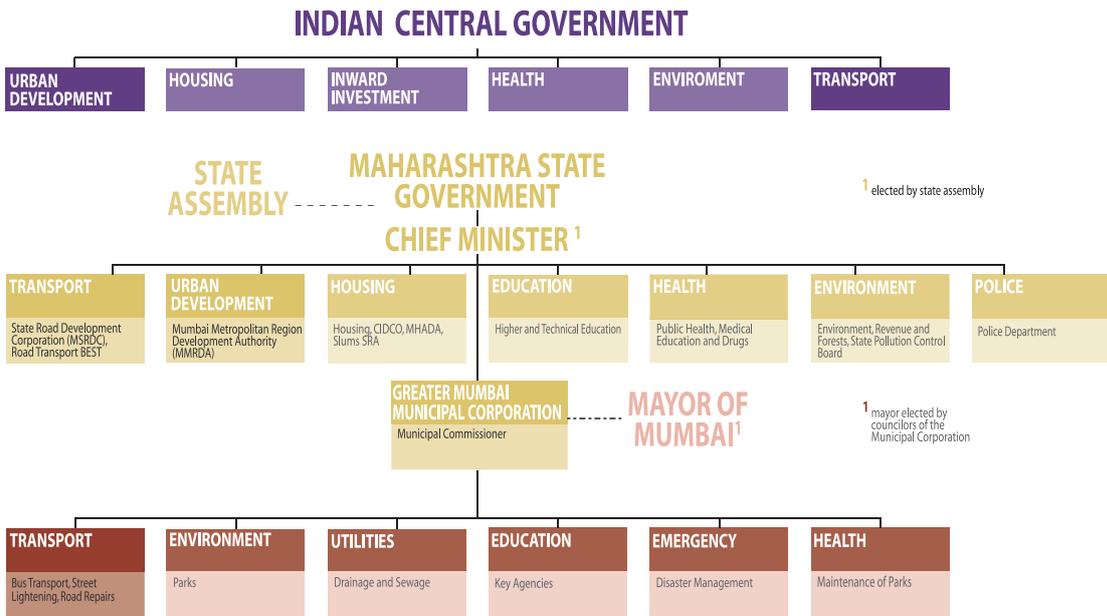


Figure 31: Mumbai's Governance Structure

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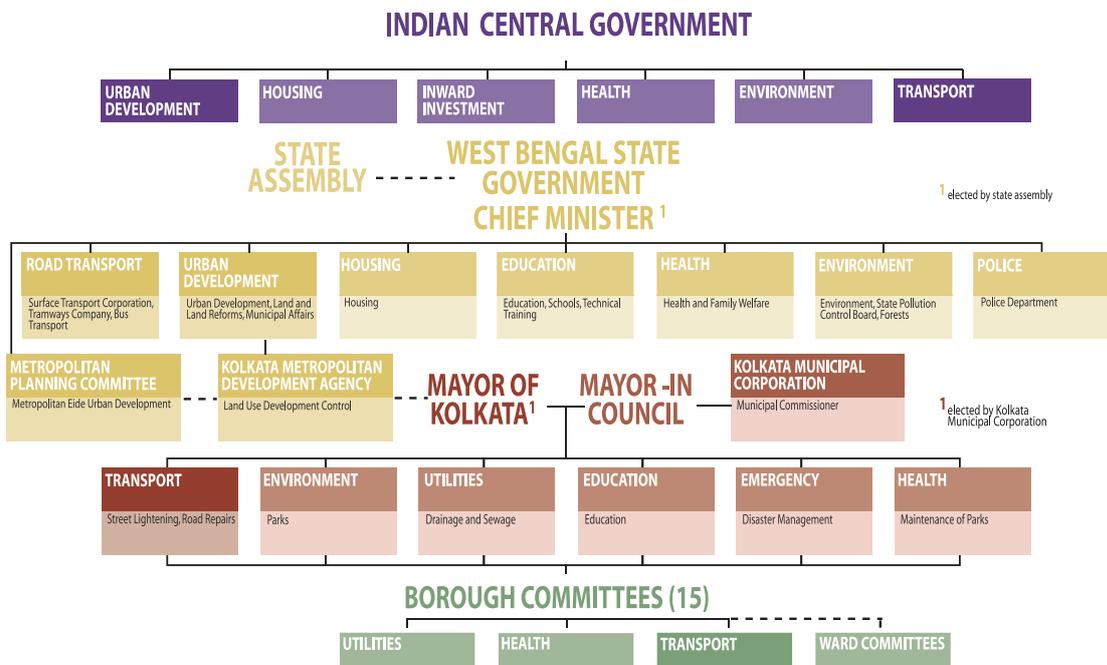


Figure 32: Kolkata's Governance Structure

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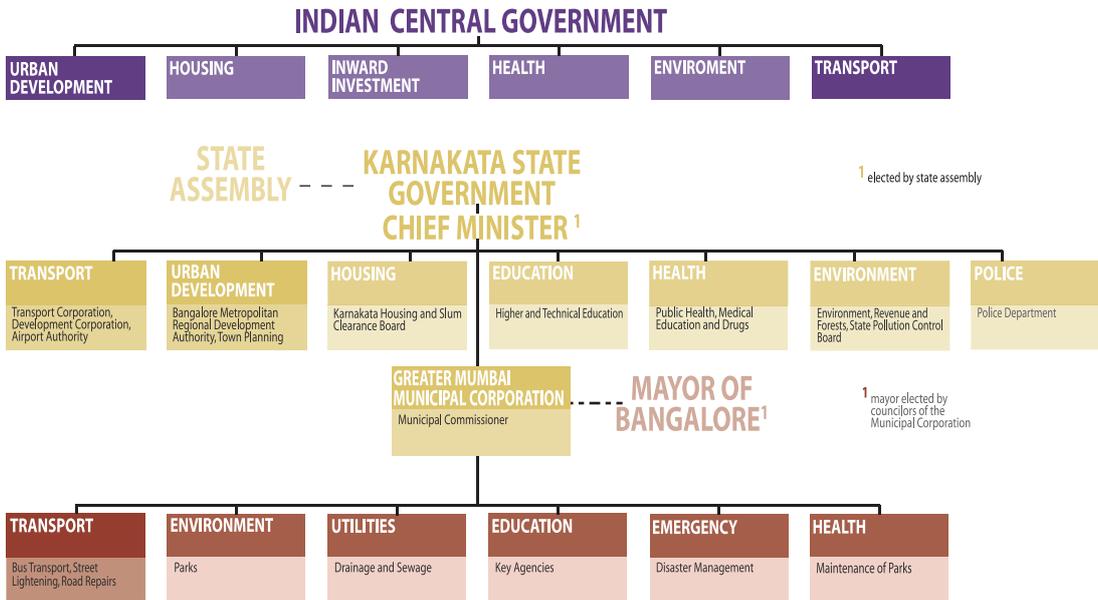


Figure 33: Bangalore's Governance Structure

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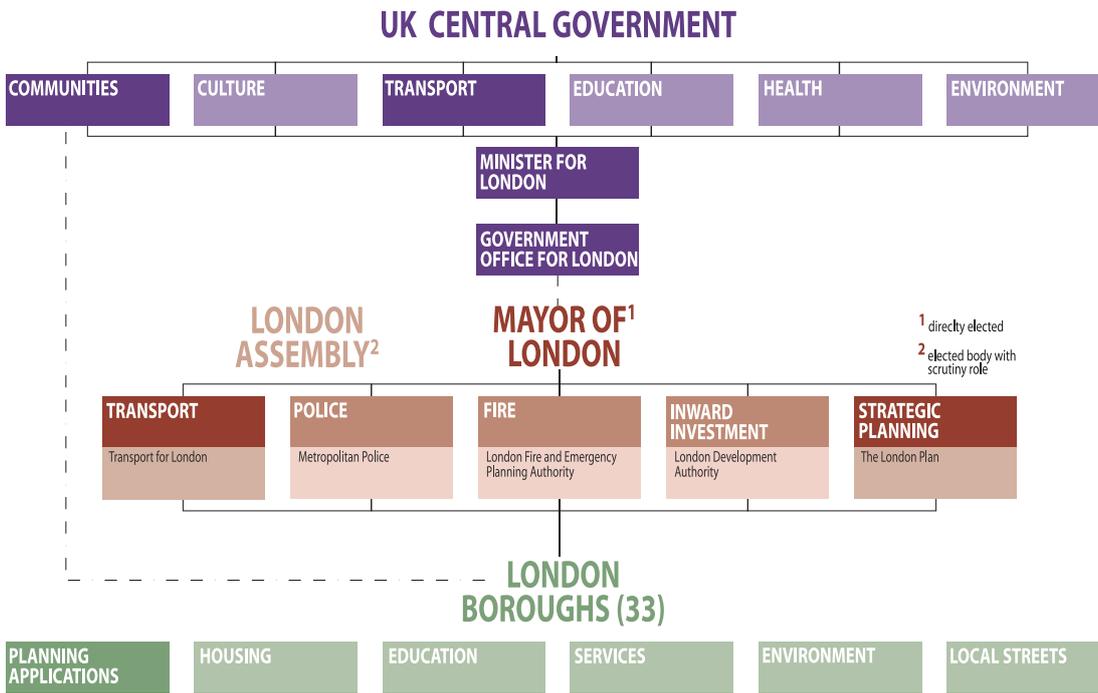


Figure 34: London's Governance Structure

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2 brief overview of urban planning in india

Most of today's major Indian cities have their roots in pre-Independence India and still rely on colonial era infrastructure. However, there have been some attempts at creating new urban paradigms in the last several decades. In the 1950s, Jawaharlal Nehru commissioned architect Le Corbusier to build a new city that was to be the symbol of the India's modern and progressive outlook. That city was Chandigarh, which Nehru famously declared to be "unfettered by the traditions of the past (and) a symbol of the nation's faith in the future".

The 2nd Five Year Plan 1956-61¹⁵², commenced the creation of town and country planning legislations in many states and initiated institutions to prepare masterplans for important towns. Masterplans for a number of cities were set up and the state capitals of Gandhinagar (Gujarat) and Bhubaneswar (Orissa) were developed in the 3rd Plan, 1961-66¹⁵³. New industrial towns like Durgapur were also built. In all cases, the emphasis was on building housing and offices for the public sector and government.

The need to limit the further growth of population in larger cities was emphasised in the 4th Plan, 1969-74¹⁵⁴. The idea of restraining the growth in larger cities and encouraging the development of smaller towns was pursued in the 5th Plan, 1974-79¹⁵⁵. Note that prevailing socialist ethos often affected urban policy preferences and caused long term damage. We saw rent control acts being introduced in many places during the socialist period (for instance, the Delhi Rent Control Act 1958). Similarly, the Urban Land (Ceiling and Regulation) Act, 1976 was enacted to prevent concentration of land holdings in urban areas. All this caused serious distortions in ownership rights and, in turn, in the nature of real estate markets. According to World Bank estimates, rent control regulations have frozen 30 percent of Mumbai's housing stock, leaving it dilapidated because landlords see little point in investing in them. Weak property rights imply that only 10 percent of the housing stock has legal title, so land redevelopment is curtailed.

The 6th Plan, 1980-85¹⁵⁶ set up the Integrated Development of Small and Medium Towns (IDSMT) for towns with population below one hundred thousand for roads, pavements, minor civic works, bus-stands, markets, shopping complexes etc. The eighties and nineties did not see new many new

"To improve urban infrastructure and provide urban services for the poor, we urgently need urban governance reform. I am happy that this Mission (JNNURM) has been structured with a clear focus on these two important components – urban infrastructure and basic services to the urban poor, with governance reform as an overarching third component."

Prime Minister Manmohan Singh, JNNURM Inaugural Speech, December 2005

¹⁵²Chapter 26, '2nd Five Year Plan', Planning Commission of India

¹⁵³Chapter 33, '3rd Five Year Plan', Planning Commission of India

¹⁵⁴Chapter 19, '4th Five Year Plan', Planning Commission of India

¹⁵⁵Chapter 5, '5th Five Year Plan', Planning Commission of India

¹⁵⁶Chapter 23, '6th Five Year Plan', Planning Commission of India

government initiatives on the urban front as attention shifted to opening up the overall economy. The new urban centres were the result of investments by private developers. While construction quality improved with individual developments, the overall urban infrastructure suffered severe strains without public investment. There has been renewed interest in cities in the last few years. Launched in 2005, the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) is the most recent Central Government initiative. The Mission is the largest initiative yet of the Government of India for planned development of Indian cities¹⁵⁷.

jawaharlal nehru national urban renewal mission (jnnurm)

JNNURM was launched in 2005¹⁵⁸. It “aims at improving the living conditions...through infrastructure development and capacity building of the Urban Local Bodies (ULBs)...through a series of reforms at the state and city level...”¹⁵⁹

JNNURM is a Central Government programme that seeks to regenerate 63 Indian cities¹⁶⁰ by initiating planned governance reforms and infrastructure development. Planned Central investment of over Rs.500 billion, along with additional State and City level funding is expected to inflate the total programme budget to Rs.1500 billion¹⁶¹. This is the single largest government effort in the urban space although it is still too early to discern its impact on India’s urbanisation.

CITY DEVELOPMENT PLANS FUNDED UNDER JNNURM¹⁶²

Agartala	Agra	Ahmedabad	Aizwal	Ajmer-Pushkar
Allahabad	Amritsar Asansol	Bangalore	Bhopal	Bhubaneshwar
Bodhgaya	Chandigarh	Chennai	Cochin	Coimbatore
Dehradun	Delhi	Dhanbad	Faridabad	Gangtok
Guwahati	Haridwar	Hyderabad	Imphal	Indore
Itanagar	Jabalpur	Jaipur	Jammu	Jamshedpur
Kanpur	Kohima	Kolkata	Lucknow	Ludhiana
Madurai	Mathura	Meerut	Mumbai-Thane	Myore
Nagpur	Nainital	Nanded	Nashik	Patna
Panaji	Pondicherry	Pune	Puri	Raipur
Rajkot	Ranchi	Shillong	Shimla	Srinagar
Surat	Thiruvananthapuram	Ujjain	Vadodara	Varanasi
Vijayawada	Vishakhapatnam			

¹⁵⁷See, www.jnnurm.nic.in

¹⁵⁸Jawaharlal Nehru National Urban Renewal Mission, ‘Overview’

¹⁵⁹Datta, P.D. and Gupta, S. (2006), ‘Community-Oriented City Development Plans’, National Institute of Urban Affairs Working Papers, National Institute of Urban Affairs, Delhi

¹⁶⁰These cities have been selected on the basis of population. Within this pool, there are 7 cities with a population of more than 4 million, 28 cities with a population between 1-4 million and 28 cities with population less than 1 million.

¹⁶¹<http://www.ccsindia.org/jnnurm.asp>; IDCL (http://www.ifindia.com/downloads/bus_concept/JNNURM.pdf)

¹⁶²<http://jnnurm.nic.in/nurmudweb/missioncities.htm>

brief overview of urban planning in india

The JNNURM programme is divided into two sub-missions; the 'Sub-mission for Urban Infrastructure and Governance' and the 'Sub-mission for Basic Services to the Urban Poor'. While the Ministry of Urban Development implements the first, the Ministry of Urban Employment and Poverty Alleviation implements the second.

The City Development Plan (CDP)¹⁶³ is the mainstay of the JNNURM reforms. ULBs are expected to develop the CDP through a participatory process involving key stakeholders in the planning stages. The resultant CDP is envisaged as a responsive and contextual document addressing local issues. Detailed Project Reports (DPRs) submitted by city authorities detail project progress and fund utilisation by them.

This framework is supplemented by a Memorandum of Agreement (MoA) signed between the Centre, State and the ULB. After development and approval of the CDP and the DPR, the ULB signs a MoA with the Centre and the State government committing itself to the project and setting out a timeline for its completion¹⁶⁴. Two other Central Government initiatives supplement JNNURM; the Urban Infrastructure Development Scheme for Small and Medium Towns (UIDSSMT) and the Integrated Housing & Slum Development Programme (IHSDP). These schemes differ from JNNURM in respect of establishing CDP as a planning tool. While under the JNNURM, configuration of a CDP is mandatory, under the UIDSSMT and the IHSDP, the CDP mechanism is absent.

SECTORS ELIGIBLE FOR JNNURM FUNDING¹⁶⁵

Urban Renewal	Water Supply Management	Sewerage and Solid Waste Management
Drain Construction	Urban Transport	Development of Parking Lots (PPP-basis only)
Heritage Conservation	Soil Protection and Renewal	Preservation of Water Bodies
Slum Development	Slum Rehabilitation	Service Delivery to Urban Poor
Housing Projects for Urban Poor	Street Lighting	Civic Amenities (including Operation and Maintenance)

¹⁶³According to the JNNURM Toolkit No.2 a "City Development Plan (CDP) is an action plan for equitable growth in a city, developed and sustained through public participation to improve the quality of life for all citizens. A City Development Plan (CDP) is both a perspective and a vision for the future development of a city. It presents the current stage of the city's development — where is the city now? It sets out the directions of change — where does the city want to go? It identifies the thrust areas — what does the city need to address on a priority basis? It also suggests alternative routes, strategies, and interventions for bringing about the change — what interventions should be made in order to attain the vision? It provides a framework and vision within which projects need to be identified and implemented. It establishes a logical and consistent framework for evaluation of investment decisions."

¹⁶⁴Ibid.

¹⁶⁵Jawaharlal Nehru National Urban Renewal Mission, 'Overview'

3 international collaboration: bridging the gap

The urbanisation of India opens up enormous potential in sectors such as green technology, construction of green and efficient buildings, effective water and waste management and transport solutions, among others. This section identifies the areas for possible collaboration and opportunities for co-development, wherein city governments, institutions and companies can collaborate along with the role that foreign governments, institutions and companies can play to support the drive for sustainable urbanisation in India.

1. partnerships between institutions/municipal governments

Bangalore and San Francisco signed a Memorandum of Understanding¹⁶⁶ (MoU) under the Sister Cities Programme in October 2008 to initiate a direct, international collaboration between the two cities. Collaborative plans in areas of economy and trade, education, health, traffic and transportation, social and cultural ties, tourism, and exchange of environmental knowledge, legal support and intellectual property will be devised under this agreement. Historically, however, it is not easy for international governments to work directly with cities in India¹⁶⁷. There are three layers of governance in India i.e. the Central, State and Local Governments, and the Central Government had historically monopolised international linkages. With globalisation and liberalisation, things are slowly changing.

In April 2008, three other Indian cities formalised city-to-city partnerships with three European cities. City of La Rochelle in France and Ahmedabad agreed to cooperate in the area of heritage management and energy conservation, while City of Halle in Germany offered to host management students from Ahmedabad and Indore and Valladolid, Spain, offered to explore partnerships with Ahmedabad for heritage management and with Pune in the automobile sector. It is too early to tell if these partnerships will bear fruit.

Of course, collaborations are also possible in the non-government space as well. I-CE Interface for cycling expertise is an international non-governmental organisation created in 1996. I-CE aims at the promotion of cycle-inclusive sustainable integrated urban and transport planning, through transfer and development of cycling expertise. The initiative is supported financially by The Netherlands' Government. It supports 30 to 50 partner cities in Africa, Latin America and Asia through the Bicycle Partnership Programme (BPP) in their ambition towards cycle-inclusive urban and transport planning. In India ICE has been promoting its programme through three formats which are:

- a. Capacity-building of organisations promoting the interest of cycling through research and training, development of concepts and support of initiatives to create a market for low-cost bicycles, influencing policies to promote cycling and giving technical expertise to engineers, designers and city planners for cycling infrastructure planning.
 - b. Funding local NGOs working on cycling programmes.
 - c. Funding and providing technical knowledge to PhD students working on low cost mobility studies.
- I-CE has a presence in Pune, Nanded and Delhi at the moment.

¹⁶⁶See www.sfbangalore.org for more info

¹⁶⁷Kulwant Singh, Association of Municipalities and Development Authorities (2008). The Association of Municipalities and Development Authorities (AMDA), established in 1983, is an Association of 63 Municipalities and Development Authorities in the country. The Association, is a knowledge sharing platform and addresses the issues pertaining to interface between the state, municipal bodies and urban development authorities in the realm of urbanisation, urban development and urban governance

2. education, training & knowledge exchange

One of the biggest constraints for India is that it lacks skilled manpower in areas such as waste management, renewable energy, urban planning and so on. For instance, India suffers from a severe shortage of trained urban planners¹⁶⁸. In India there is 1 planner for every 100,000 people, while in the USA there is 1 planner for every 5000 people and according to global best practice Bangalore alone needs 5,000 additional planners. The tertiary education system is just not equipped to supply this need; India has just eleven urban planning programmes across the country. Clearly, there can be large gains from bringing in international quality education and training. Unfortunately, this is related to a larger and politically contentious area of higher education reform. This is not the place to debate the issue of liberalisation in higher education in India, but we do feel that there is an opportunity for the creation of platforms that can play a role in this space by bringing together key stakeholders. The newly established “Sustainable Planet Institute” is trying to fill this gap (for details see: www.sustainableplanetinstitute.org).

3. business partnerships and investments

There are clearly investment opportunities in India in the areas of transportation infrastructure, waste management, water treatment and so on.

In June 2008, Singapore’s water agency PUB signed a MoU with Maharashtra Jeevan Pradhikaran (the Maharashtra Water Supply and Sanitation Board) to collaborate on projects that minimise water wastage and improve water infrastructure in Maharashtra’s cities and towns. The MoU will facilitate collaboration between PUB and MJP, as well as promote participation by Singapore-based companies in urban water management in the state, including major cities such as Mumbai and Pune. Areas of cooperation will include leak detection and reduction in unaccounted-for water; water and wastewater treatment and recycling; emerging technologies and best practices in water reuse; the management of urban runoff; management of water supply and demand; and institutional capacity building. One of the first projects identified under the MoU will transform the intermittent water supply in the town of Ambarnath, near Mumbai. Ambarnath’s population of 270,000 has water for only three to four hours a day, and there is a high level (21 per cent) of unaccounted-for water (UFW). The plan is to introduce a round-the-clock water supply and reduce UFW, with the PUB sharing its capabilities in integrated water resource and demand management, and the secrets to Singapore’s 5 per cent UFW rate, which is one of the world’s lowest. Singapore-based companies such as pipeline rehabilitation specialists Teacly (S) Pte Ltd will work with MJP and Indian partner companies on MoU projects. PUB’s wholly-owned subsidiary, PUB Consultants Pte Ltd, will act as technical consultants.

Another example is the Clinton Foundation which is helping set up a 5-gigawatt solar project that could cost almost USD 5 billion. The project, coined the Integrated Solar City, is supposed to be built in the state of Gujarat in western India in collaboration with the state government. It will both provide solar power and manufacture solar materials. The Clinton Foundation is also in talks with governments of Andhra Pradesh and Rajasthan for setting up solar power projects.

¹⁶⁸Ramanathan, S. (2007), ‘Where are the Urban Planners?’, www.Janaagraha.org

4

smart growth versus sprawl¹⁶⁹

	SMART GROWTH	SPRAWL
EMPHASIS	Accessibility-to goods, services and activities	Mobility-physical movements, particularly by car
DENSITY	Higher density, clustered activities	Lower density, dispersed activities
GROWTH PATTERN	Infill development	Urban periphery (greenfield) development
LAND USE MIX	Mixed	Single use, segregated
PUBLIC SERVICES	Local, distributed, smaller, walking access	Regional, consolidated, larger, requiring car access
TRANSPORT	Multimodal transportation and land-use patterns that support walking, cycling, and public transportation	Car-oriented, poorly suited to walking, cycling, and public transportation
CONNECTIVITY	Highly connected roads, pavements and paths allowing more direct travel by motorised and non-motorised transport modes	Hierarchical road network with many unconnected roads and walkways, and barriers to non-motorised transport
STREET DESIGN	To accommodate a range of activities, with street calming	Designed to maximize vehicle throughput
PLANNING PROCESS	Planned and coordinated between jurisdictions and stakeholders	Either unplanned/little coordination, or planned (e.g. US)
PUBLIC SPACE	Emphasis on streetspace, pedestrian areas, public parks and public facilities	Emphasis on private realm-of shopping malls, gated communities, private clubs

¹⁶⁹Asian Development Bank (2007), 'Environment and Transport Background Paper', Managing Asian Cities Study, Manila

5 analysis of CDPs of 20 cities vis-à-vis urban form and walkability

CITY	URBAN FORM/ DENSIFICATION	PEDESTRIANISATION																				
DELHI	<p>Re-densification of the zones with low density and high land value has been proposed.</p> <p>As per the provision of MPD-2001, the gross density of residential areas should be 350 PPH or 78 DU/ha with FAR of 33%.</p> <p>Low Density areas as identified include:</p> <table border="1"> <thead> <tr> <th>Existing Area</th> <th>Gross Density in PPH</th> <th>Ground Coverage</th> <th>FAR</th> </tr> </thead> <tbody> <tr> <td>Lodhi Colony</td> <td>222</td> <td>18</td> <td>37</td> </tr> <tr> <td>RK Puram</td> <td>190</td> <td>17</td> <td>35</td> </tr> <tr> <td>Moti Bagh</td> <td>145</td> <td>15</td> <td>31</td> </tr> <tr> <td>Laxmibai Nagar</td> <td>225</td> <td>19</td> <td>38</td> </tr> </tbody> </table> <p>(See below for re-densification plan for Delhi)</p>	Existing Area	Gross Density in PPH	Ground Coverage	FAR	Lodhi Colony	222	18	37	RK Puram	190	17	35	Moti Bagh	145	15	31	Laxmibai Nagar	225	19	38	<ul style="list-style-type: none"> The Karol Bagh area - The grid iron pattern is to be treated as an asset to regulate and pedestrianise traffic movement. “Prepare Special Integrated schemes for movement in CP and Old City Area strategy” includes pedestrianisation of inner circle in Connaught Place including parking below inner circle and pedestrianisation (partial) of Chandni Chowk Area with heritage considerations. Transport strategy includes equitable use of space on roads, and priority to pedestrians. A total of Rs.1.25 billion has been allocated for strengthening and improvement of footpaths along major arterial roads, construction of foot over bridges/subways at ten critical locations and modernisation of street lighting.
Existing Area	Gross Density in PPH	Ground Coverage	FAR																			
Lodhi Colony	222	18	37																			
RK Puram	190	17	35																			
Moti Bagh	145	15	31																			
Laxmibai Nagar	225	19	38																			
CHENNAI	<ul style="list-style-type: none"> Plan to densify the city by 35% has been proposed in the CDP. A spatial strategy to permit high density development along transport corridors and in peri-urban areas viz., higher FSI within the influence area of the MRTS Corridor, Outer Ring Road. 	<ul style="list-style-type: none"> An amount of Rs.1.02 billion has been allocated to build pedestrian subways 																				
KOLKATA	<ul style="list-style-type: none"> Plan to densify the city by 35% has been proposed in the CDP. A spatial strategy to permit high density development along transport corridors and in peri-urban areas viz., higher FSI within the influence area of the MRTS Corridor, Outer Ring Road. 	No mention.																				
MUMBAI	No mention.	No mention.																				
BANGALORE	No mention.	<ul style="list-style-type: none"> The city plans to develop pathways and subways at railway gates for pedestrians. 100 km of restoration of footpaths- Improvement of old/worn out footpaths and restoration of footpaths where they do not exist and removal and relocating utilities that are present on footpath to provide right of way to pedestrians has been planned. Raised Crosswalks/Pelican Signals have been planned for 50 locations and Pedestrian Walkovers for 10 locations. 10,000 m of Barricading of footpaths has been planned. Pedestrian only zones to be introduced. 																				

CITY	URBAN FORM/ DENSIFICATION	PEDESTRIANISATION
INDORE	No mention.	<ul style="list-style-type: none"> • Improvement of pedestrian facilities is part of the traffic management strategy.
PUNE	The Slum Redevelopment Authority allows FSI of 3 to promote high density development in slum areas as against the normal FSI of 1. Action plan includes revitalisation of core area by promoting high density and high rise provision in the old city limits. Peri-urban city corridors will be identified for redensification and integration with transport networks. High density housing will be encouraged. For every 1 FSI an extra 0.4 FSI is given to the builder.	<ul style="list-style-type: none"> • Improvement of pedestrian facilities has been proposed.
AHMEDABAD	As per the CDP in terms of spatial expansion unlike Bangalore and Hyderabad, the city during the past ten-year period has expanded in a contiguous manner and remained compact. (See below for Population density map of Ahmedabad and comparison of Ahmedabad land use with Bangalore and Hyderabad)	No mention.
KANPUR	No mention. The core city is already very dense.	Plans to improve pedestrian facilities have been proposed.
VADODRA	No mention.	No mention.
NAGPUR	The density of Nagpur is considered very low as compared to other cities. Plans to carry out detailed studies would be carried out to identify corridors where densification is possible. Schemes to revise FSI norms to allow high density development have been proposed.	No mention.
VARANASI	The density in inner city is considered abnormally high leading to unhygienic conditions.	No mention.
CHANDIGARH	No mention.	No mention.
GUWAHATI	No mention. Unplanned urbanisation has led to increase in density and congestion. The city thus plans to develop a decongestion programme	No mention.

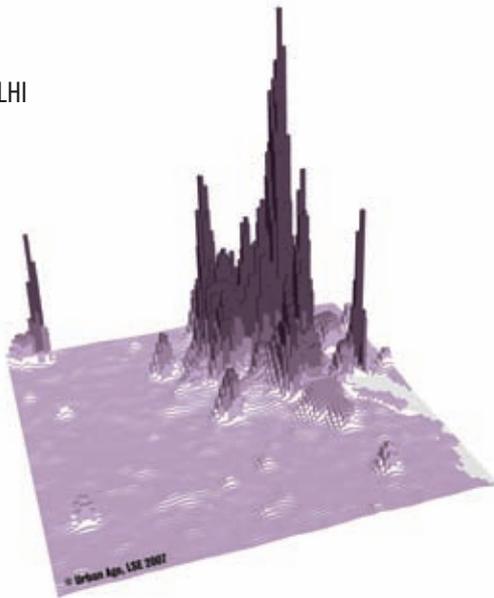
analysis of CDPs of 20 cities vis-à-vis urban form and walkability

CITY	URBAN FORM/ DENSIFICATION	PEDESTRIANISATION
JAIPUR	<p>High density within the walled city is considered a weakness. The government sees the decline in density in the walled city since 1991 as a positive phenomena. As per the CDP, densification of areas in the city might lead to high levels of burden on the infrastructure. Bye-laws have been proposed to decrease the density of the walled city.</p> <p>However redensification of low-density areas on the periphery of the city such as Ashok Nagar, Bani Park, Gandhi Nagar is being planned.</p>	No mention.
ALLAHABAD	No mention.	Improvement of signals for the benefit of pedestrians and creating a good environment for pedestrian movement has been planned.
UJJAIN	No plans for further densification.	Certain areas in the city like the Chowk area have been planned to be completely pedestrianised. Developing better pedestrian facilities has been planned.
MEERUT	The development authority and other agencies in Meerut are trying to reduce the population density within the inner city area. As per the CDP, high population density and increased economic activities in the inner city areas have resulted in excessive stress on existing infrastructure.	Improving pedestrian facilities has been planned.
COIMBATORE	No mention.	Pedestrian subways, crosswalks and 1.5m - wide footpaths have been proposed along the major roads where heavy pedestrian movements are observed.

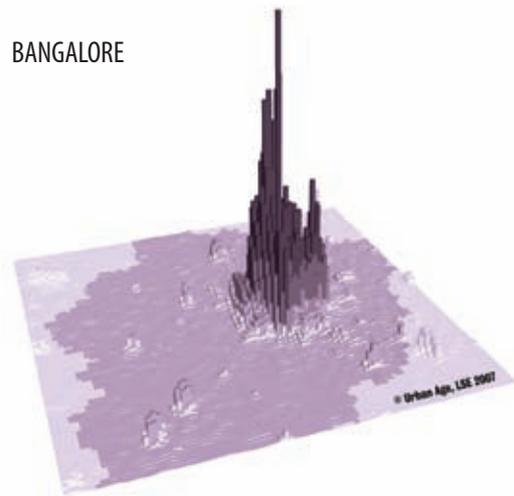
6 population density chart of cities

The following charts have been sourced from *Integrated City Making report (2008)* of *Urban Age, London School of Economics and Political Science*. They illustrate the land use pattern in cities in terms of sprawl and compactness.

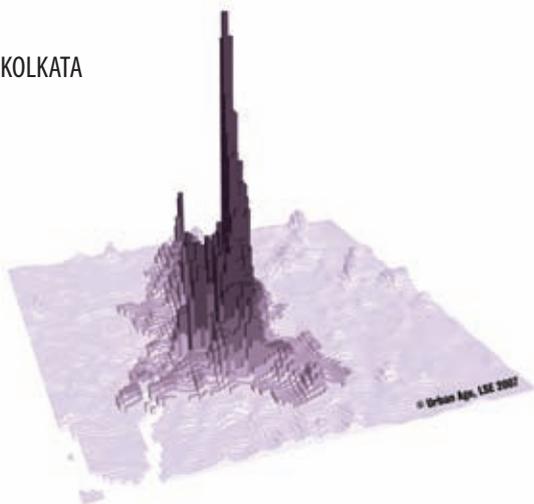
DELHI



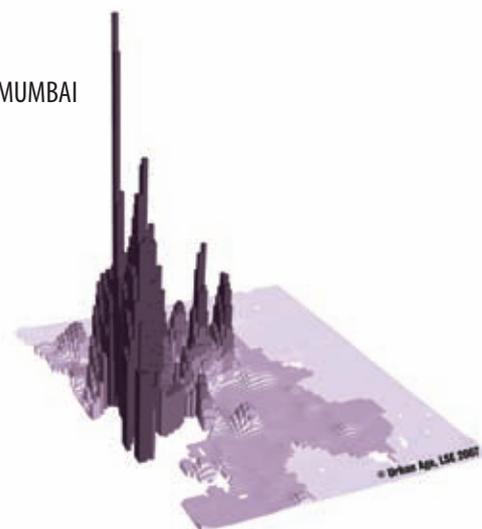
BANGALORE



KOLKATA



MUMBAI



7 on two legs and a prayer¹⁷⁰

Automobiles overwhelm Indian urban space: physical and imagined. Walking does not figure in the Great Indian Urban Plan. Pedestrians face grave risks. But automobilized city managers ignore a simple fact: walking is the basis of urban mobility. Even in car-crazy Delhi, one in every three trips is only on foot.

Stuck in traffic on an old scooter, Amarnath Tewary, journalist in Patna, was getting late for an appointment. After progressing 100 metres in 20 minutes, a question occurred: why not walk? Two legs could speed up things on the road. And then there was the inviting prospect of shedding a few kilos around his waistline. He discussed it with his wife and daughter.

Tewary described how his first walk-to-work day began: it featured a recently purchased pair of Nike joggers, an absent scooter, and a chartbuster from the Mumbai film factories that whistled through his lips. An estimated 25 minutes would transport him across the four-km daily commute to his office at Fraser Road. Four minutes into his new routine, he hit the marketplace and saw things he had not noticed from above the safety of two wheels. "There just wasn't the space to walk, no pavements," he said. He discovered the difficulty of walking past someone without body contact. "I should have bought a horn instead of the Nike shoes," he said.

The horn, though, would not have helped negotiate a bull that he skirted, but that meant his leg slipped into sludge heaped beside an open manhole. Before long, a bicyclist expectorated betel juice right on to his trouser legs and shoes. Next on the obstacle course was a series of puddles. Tewary rolled up his trousers and attempted a jump. Without so much as a splash, he landed on his athletic feat. Before he could feel too happy, a motorcycle sped past, depositing the contents of the puddle on to his trousers. He had had enough of walking. He hired a rickshaw on his way back.

how many people walk?

Hiring a rickshaw or riding a scooter are not options available to Annapurnabai. Her 60 years saw her leave farm labour to become a domestic help in Nagpur. Now, she does not work-not because she is too old to work but because traffic makes it impossible to walk. She used to walk between 10 km and 14 km every day. "In those days, there were wide roadside spaces and shady green trees. One could walk barefoot," said she, claiming she is physically fit to walk the same distances but cannot cope with the traffic and the heat-the trees are gone to create more space for motorised traffic.

Indian cities have millions of stories like Tewary's and Annapurnabai's. But it isn't easy to put a number to these stories. Geetam Tiwari, professor at Indian Institute of Technology in Delhi, tried to obtain data on walking. She could not find any from before 1994. For motorised vehicles in Delhi, data is available since the 1950s. "This shows walking has not been a priority in the planning of cities and transport infrastructure."

A 2008 study of 30 cities showed 16-57 per cent of all trips involve no vehicles at all. Smaller cities and hill towns, where walking commands a greater share of trips, figured at the higher end of this classification. Bigger cities, which have some semblance of pedestrian infrastructure unlike the smaller cities, have fewer people relying only on walking. The study by US consultancy Wilbur Smith Associates assessed footpaths and overall infrastructure, including pedestrians' ratings of the

¹⁷⁰Sen, J., Seth, B.L. and Jamwal, N. (2009), 'On Two Legs and a Prayer', Down to Earth, Society for Environmental Communications

facilities. The Union Ministry of Urban Development had commissioned the study to draft a transport strategy.

The study indexed cities for walkability. The national average was 0.52. Chandigarh came on top with 0.91; cities such as London score 1.5 to 1.7.

measuring walkability indian cities ranked on scale of 4

The survey showed 21 per cent of all trips in Delhi were only on foot. This share was 34 per cent in another 2008 survey, this one by RITES Ltd, a government-owned consultancy. The figures vary depending on the survey, but there is no other way to estimate the unestimated. The two studies are not comparable, said Vinoba Sunder Singh of Wilbur Smith. "There are limitations to our study. While people's perception got 50 per cent weightage to the score, mere presence of footpath was accounted," said Singh, adding they did not study its quality.

Mumbai has more walkers than Delhi-43 per cent, according to a 2005 study by the World Bank-about four times the number of people using private vehicles. Another survey from 2005-08, by the Mumbai Metropolitan Region Development Authority, estimated the number at 52 per cent. In Ahmedabad, cycling and walking constitute 54 per cent of all trips, said a 2005 report of the Centre for Environmental Planning and Technology.

Walkers outnumber those using vehicles in Indian cities. Even in car-crazed Delhi, the percentage of walking-only trips has remained high over time, said Yash Pal Sachdeva of RITES; it was 32 per cent in 1994 and 33 per cent in 2001.

The walk-only trips in cities would be higher if public transport trips were included in estimates; each public transport user is also a walker at least four times a day. The Wilbur Smith report showed Kolkata ranked low in terms of pedestrian share in trips per day-19 per cent, excluding trips linking public transport. But the city has the highest public transport share: 54 per cent.

So, people walk. Was Tewary in Patna too hasty in reverting to his scooter after a one-day trial? A close look at roads in Indian cities shows how the pedestrians never seem like a constituency to city managers. The employment-and safety-of Annapurnabai in Nagpur is not a real concern, though the old woman and her need for employment is very real, as is her fear of roads.

insurance for walkers?

Diwakar Mohani is 80 and an inveterate cyclist. "The roads of Nagpur are better than ever before. But traffic has become unruly and law enforcement has not kept pace. The bicycle has become a vulnerable mode. My family is always nervous about me moving around on one."

Unlike Mohani, Subrata Sen, writer and social activist in Nagpur, has stopped walking. "On improved

on two legs and a prayer

roads, vehicles speed at no less than 60 km per hour. Because of poor traffic regulation, people jaywalk. It is dangerous," he said.

The number of people killed in road accidents in India has increased about 8 per cent each year for the past decade. Pedestrians account for 60 per cent-more than 80,000-of all fatalities in urban areas, revealed a joint report by researchers from the US University of Michigan and IIT, Delhi.

Ramchandra Nayak knows. The 75-year-old from Bhubaneswar survived a road accident six months ago. "A car hit me during my morning walk. Since there are no footpaths, I had little choice but to walk on the road," said he. He has stopped going for a walk since.

During 1970-2005, the number of motor vehicles registered increased 50 times. While the road network grew less than three-fold, accidents increased four-fold. Lack of footpaths, cycle tracks and unchecked speeding were to blame.

India's National Urban Transport Policy acknowledged the risk: "Use of cheaper non-motorised modes like cycling and walking has become increasingly risky, since these modes have to share the same right of way with motorised modes."

From policy to urban plans is a short journey. Delhi's Master Plan 2021 desires a pedestrian friendly city, major work centres with large numbers of pedestrian networks.

The master plan talks of upgrading public transport to international standards for the 2010 Commonwealth Games. To optimise the carrying capacity for each mode, transport projects must be integrated, said Pradeep Sachdeva, an architect in Delhi who designs public spaces in Indian cities.

The Public Works Department in Delhi has commissioned a pilot project to improve walkability in select areas. The project is to design and develop about 25 km around four stadium areas and some arterial roads. The concept design along side footpaths includes lanes for non-motorised transport and auto rickshaw stands, he said.

It is essential to connect Delhi's metro stations with pedestrian networks, said Tripta Khurana, chief architect, Delhi Metro Rail Corporation. "We plan jointly with the Delhi Transport Corporation to establish feeder bus services. For pedestrians, urban local bodies must ensure their needs are fulfilled." A senior official of the New Delhi Municipal Corporation admitted that more needs to be done.

The Centre for Science and Environment, NGO in Delhi, surveyed pedestrians on Delhi walkways to understand their convenience, security, safety and quality of services. No location made the top grade. Of all the sites assessed, the dedicated pedestrian path in the pilot bus rapid transit corridor (between Ambedkar Nagar and Chirag Delhi) scored the highest.

"Little attention is given to pedestrians outside the corridor," said Sachdeva. The captive pedestrian, who cannot afford alternative modes of transport, is the biggest loser.

vehicles, vehicles, vehicles

The reasons for congested cities are well known. Planners focus on the movement of vehicles, not people. Governments invest large sums in roads and elevated roadways to provide mobility to a minority: vehicle owners. Yet traffic speed and road availability per vehicle have reduced, despite road widening and flyovers.

Faulty designs and urban land use policies are fast razing the walking environment in India. The widening of roads alongside elevated routes and flyovers are a constant hindrance on pedestrian routes. The direct course of access for pedestrians is replaced by long-drawn routes. The vehicle lobby pushes pedestrians to subways and foot overbridges. To save time and effort pedestrians put themselves in harm's way.

Ill-planned motorisation kills one person every six minutes on average. This has pushed the Union Ministry of Shipping, Highways and Road Transport to draft a National Road Safety Policy. It talks of traffic education and social and economic implications of road accidents. It says the government will provide financial assistance to states and local bodies to improve the quality of investigation of crash incidents for data collection, transmission and analyses. The Indian Road Congress, premier technical body of highway engineers set up in 1934, has design guidelines for roads and pedestrian pathways. These ask for a minimum footpath width of 1.5m to 4m. But no urban body is legally bound to maintain a dedicated space for pedestrians.

not binding by law

In a 2008 consultation paper, the Law Commission of India observed that in the absence of a Central legislation, it is left to the states to legislate on road safety. The Motor Vehicles Act, 1988, is supposedly a deterrent to rash and negligent driving. The Rules of Road Regulation, 1989, do mention pedestrians' right of way at unregulated crossings.

But little of all this means anything on the road. "I know it's wrong but cars never stop for pedestrians," said Rohit Pillai, a Delhi motorist. "People either honk or abuse if one attempts to do so." A Down To Earth correspondent caught up with Chandrasekhar, in Mumbai, as he was waiting to cross the road at the Marine Drive. "One needs to sprint, even on a zebra crossing. The traffic signal turns green for such a short while that barely half the road can be crossed.

The Marine Drive is a three-km stretch along the Arabian Sea. It has a promenade that lends itself to pedestrians. But the footpaths are too high, especially for the elderly. Other parts of the city are devoid of pedestrian facilities. "There are no footpaths in Mumbai's suburbs," said Pankaj Joshi, architect and executive director of the Urban Design Research Institute in Mumbai. The Mumbai Metropolitan Region Development Authority is busy implementing infrastructure projects such as the metro, monorail, sea links, expressways and flyovers. But footpaths are not on its agenda. "Business districts have been developed for only those who have cars. Even though footpaths have been provided in some places, these do not connect or integrate with other parts of the city," said Joshi.

vehicles, vehicles, vehicles

Urban planners and architects claimed the state government was working against its own data, which showed that walking accounts for about 55 per cent average daily trips. "In its right sense, any planning agency should cash in on this figure and strengthen infrastructure for walkers," said Ashok Datar, a transport expert working with the non-profit Mumbai Environmental Social Network. "But it looks like the development authority wants people to use their cars. It has now started constructing skywalks for pedestrians. The skywalks resemble caterpillars, are ugly, and do not solve the problem. These are required in some areas but should not be replicated all over."

Off the road, on to a skywalk elevated walkways are meant to disperse commuters from congested areas like bus stations. The development authority has planned 50 skywalks in the Mumbai Metropolitan Region at an estimated cost of Rs 6 billion. One such pilot skywalk, between Bandra (E) station and Bandra-Kurla Complex, is operational since June 2008. It is 1.3 km long and four metres wide.

"The skywalk was constructed for a peak hour capacity of 5,500 commuters but less than 100 people use it. The authority spent about Rs 130 million on it," said Datar. He added there is a mismatch between pedestrian needs and what the state has to offer.

Sudhir Badami, transport consultant in Mumbai, said mindless sprouting of skywalks proved the government did not want to get footpaths in order. Badami, who studied at IIT Mumbai in the 1970s, lives in Babulnath Marg in south Mumbai. "Footpaths in Mumbai were in a much better condition earlier. I would walk back from the Grant Road station. But now I am forced to take a taxi because the footpath is a mess and nonexistent."

non-negotiable right

Everyone has a right to space on the road, said Faizan Jawed, an architect-cum-activist in Mumbai. "Why should they be left for private cars, and pedestrians be pushed on to skywalks? Pedestrians must be provided space on the road. This is non-negotiable." Non-profits have launched a campaign against skywalks in areas that have footpaths. Jawed also campaigns for dedicated cycle tracks in the city. "Cars cannot solve the transportation and congestion problems. They are the problem. We must pressure our government to provide good footpaths and dedicated cycle tracks," he said.

Neera Punj, convener of a people's group called CitiSpace, alleged the state government was ready to push only those transportation projects that involved millions of rupees and private companies. "The footpath in front of our society used to have hundreds of hawkers," said Punj who lives in Lotus Court near Churchgate station in south Mumbai. "In 2001, our residents' association decided to adopt the pavement and maintain it. It entailed a lot of administrative hassles but we managed to remove the hawkers. Our association spends Rs 40,000 per month for the pavement's protection and upkeep." But not all associations are rich enough to spend that kind of money. "Why should residents pay when they are paying taxes?" asked Punj.

As a policy, agreed a few town planners and architects Down To Earth spoke to, cities need to ensure there is an adequate network to help pedestrians directly travel to destinations. But the urban habitat model is changing rapidly. With segregation of land use supporting low-density development, commuting distances have steadily increased. The burgeoning Indian middle class is aspiring and

looking at motor vehicles as an indispensable extension of itself.

Indian cities, unlike the ones in the US, have dense urban cores that are highly conducive for walking. But the share of walking trips is fast disappearing with the modern urban expansion being more car and two-wheeler oriented. "A disturbing trend revealed in the 2008 survey is the share of bus trips has slipped drastically," said Sachdeva. Delhi faces the danger of losing its walkability heritage, he added. The percentage of bus trips have fallen from 60 per cent in 2001 to 41 per cent in 2008, while over the same period car trips have increased 3 per cent to 13.

RITES projects if Delhi implements all the public transport schemes as planned today, there would still be a shortfall of nine million trips. The projections are based on estimates that the population of Delhi between 2001 and 2021 shall grow from 14 million to 23 million. During this period vehicular trips are estimated to grow 131 per cent.

walkability is no rocket science

Urban planners say it is easier to turn Mumbai into a pedestrian-friendly city provided the planning authorities will it. It will also be cost-effective compared to other transport projects such as the Rs.200 billion metro rail project.

Joshi of the Urban Design Research Institute said there is a need for citywide study to identify bottlenecks for pedestrians first and then take simple measures such as painting zebra crossings, reprogramming signals or increasing the duration of traffic signals so that people like Chandrasekhar don't have to sprint to cross the road. These measures can go a long way in easing pedestrian problems, he said. The institute has launched a year-long project to study how Mumbai can be made more walkable. Initial findings show how the system discourages pedestrians.

Two traffic signals in front of the Chhatrapati Shivaji Terminus, one of the busiest stations in Mumbai, illustrate the problem. "Both these traffic signals are programmed in a manner that pedestrians can never cross the road," said Kirti Maknija, architect with the institute. "The divider between the road is so narrow that barely one person can stand on it. There are many more traffic signals like these which discourage pedestrian movement."

a public space called the road

Architects are trying to incorporate hawkers in the city's plan. An architecture institute in Juhu in Mumbai is conducting one such study. "Our study area has a mixed population, ranging from film personalities to two urban villages, fishing villages and slums," said Benita Menezes, lecturer at the design cell of the Kamla Raheja Vidyanidhi Institute for Architecture (KRVA). "We realised that the Irla nala flows through these areas and we could use it." The institute, along with P K Das and Associates, an architecture firm, and Juhu residents conducted a study in 2008. Commonly known as Vision Juhu, the aim of the study was to integrate various public spaces in Juhu and make the areas more pedestrian friendly.

a public space called the road

The Institute has proposed a six-metre-wide stretch on both sides of the Irla nala should be protected and developed in a way that the water flow is enhanced and the developed area used to relocate hawkers. The developed area would also have walkways and be connected to other open areas of Juhu, allowing pedestrian movement.

Then there are three metro stations within Juhu and all three open on the main roads. "Can you picture the chaos on roads when commuters from these stations come out? We have proposed realignment of these stations. If that is done, then burst points for metro stations would be open spaces. From there people can use footpaths or the developed sidewalks of Irla nala," said Menezes.

There are several nalas like Irla, and small rivers in Mumbai, that can be developed along the same lines. But Menezes is of the opinion that one big plan for the city won't work. The city needs a multi-scalar approach in which neighbourhoods prepare their own plans and see how best their area can become walkable, she added.

Citizens are becoming assertive. Several cities now have campaigns to push the pedestrian agenda. Hyderabad's Right To Walk campaign has led to the creation of a pedestrian safety cell. Last year, a Mumbai group headed by Krishnaraj Rao formed Sahasi Padyatri (meaning brave pedestrians), an informal group of residents demanding easy and safe footpaths. In March 2008, the group went around Mumbai suburbs and painted lanes on the road and declared them "only for pedestrians".

"We organised many such events. We expected people in cars to get angry, but their response, surprisingly, was positive. I think people saw the point," said Rao. He said foot overbridges were coming up in some areas but a lot more needed to be done.

Architects demand that the comprehensive transport survey 2005-08 be made public. "We have tried our level best, even through Right To Information application, but haven't been able to lay our hands on the survey. I feel the Mumbai Metropolitan Region Development Authority fears if this study is made public, people will question the very basis of sanctioning costly transportation projects," said Joshi. "Without a comprehensive assessment, such projects should not be cleared. If we provide proper footpaths for pedestrians, there is no need to construct a single skywalk in the city."

immobile and dangerous

The immediate sign of the mobility crisis in Indian cities is traffic congestion and pollution. This may worsen as more commuters shift to personal vehicles.

While city managers and leaders have begun to eye the political returns on public transport investments, the most crucial link that remains invisible and neglected is walkability, the link between different modes of transport. If this is neglected in the planning process, it could, as in the case of Delhi, reduce demands on public transport. Eventually those who can afford it will switch to personal means of transport.

The pedestrian movement has gone beyond footpath development for safe and comfortable passage. The aim has been to create a new ethos of urbanity by reducing automobile dependence. Urban planners and architects say the first step should be to improve the engineering and environmental features of pedestrian ways. The next step is to enforce measures to calm the traffic. One well known example is from the Netherlands, called Woonerf; it literally means a group of streets where pedestrians and cyclists are prioritised.

Indian cities have the chance to grow differently. In most cases people walk, cycle or take the bus. These cities could build on this inherent strength. In small and medium towns where the problems of mobility have not yet manifested, provision and planning could include cycle tracks and pedestrian networks. Civic authorities need a wing working full time on traffic calming measures, alongside attempting to maximise the transition of commuters from motorised modes of transport to non-motorised and public transit trips.

Perhaps Amarnath Tewary will then junk his scooter for good.



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key informants¹⁷¹

policy makers/public administrators

1. Ajay Mathur, Director General, Bureau of Energy Efficiency (BEE)
2. Anil Dussa, Director, Ministry of New and Renewable Energy
3. Anshu Prakash, Chairman, Delhi Transport Corporation
4. Arun Maira, Member, Planning Commission, Government of India
5. BI Singal, Director General, Institute of Urban Transport, India
6. David Adam, Head of Emerging Markets, London Development Agency
7. Deepak Gupta, Secretary, Ministry of New and Renewable Energy
8. G Bharti, Municipal Corporation of Delhi
9. KT Ravindaran, Chairman, Delhi Urban Arts Commission; and Head of Urban Design, School of Planning and Architecture
10. Kulwant Singh, Director, Association of Municipalities and Development Authorities
11. Sean Randolph, President & CEO, Bay Area Council Economic Institute
12. Shovana Narayan, Joint Director General, 2010 Delhi Commonwealth Games Organising Committee

academia/ think tanks/ opinion leaders

1. Amit Kapoor, Chairman, The Institute for Competitiveness
2. Arthur I Segel, Professor of Management Practice, Harvard Business School & Chairman, The Xander Group Inc
3. Arun Kapur, Director, Vasant Valley School
4. Arun Kumar, Professor of Economics, Jawaharlal Nehru University
5. Avnita Arora, Resident Representative India, Interface for Cycling Expertise; Professor, Indian Institute of Technology, Delhi
6. Fred Steward, Professor of Innovation and Entrepreneurship, NESTA
7. Kiran Karnik, President, India Habitat Centre
8. Manit Rastogi, Managing Director, Morphogenesis Architecture Studio
9. Michael Blowfield, Teaching Fellow in Corporate Responsibility, London Business School
10. Partha Mukhopadhyay, Senior Research Fellow, Centre for Policy Research
11. Philipp Rode, Executive Director, Urban Age, London School of Economics & Political Science
12. Pratima Washan, Consultant, Energy for Sustainable Development
13. Raj Liberhan, Director, India Habitat Centre
14. Rajat Ray, Dean, Sushant School of Art and Architecture
15. Sam Miller, Journalist and Author of 'Delhi: Adventures in a Mega City'

¹⁷¹As part of its research programme, Mirabilis Advisory initiated a partnership with the Delhi-based India Habitat Centre to host a series of discussions on 'Alternative Urban Futures' in Delhi, Gurgaon, Pune, and London. This initiative, titled Urban Habitats Forum, enabled the research team to engage a multi-disciplinary group of experts in a live exchange, which enriched the research process, and enhanced the data set used for analysis. A summary of all the discussions can be seen at www.habitatsummit.org.

key informants

professionals/ business community

1. Abhay Kumar Mishra, Chief Executive-Special Projects, Emaar MGF
2. Aromar Revi, Director, TARU Leading Edge Consultants
3. Arun K. Nanda, Executive Director & President, Infrastructure Development Sector, Mahindra & Mahindra Limited
4. Aruvana Das Gupta, Architect and Urban Designer and Founder Member of Institute of Urban Designers - India
5. Ashish Goel, Co-Founder & COO, Intergy Corp.
6. Ashok Lall, Architect
7. Brian S. Garrison, Managing Director, Forest City International
8. James P. Herlihy, Co-Chair, San Francisco Bangalore Sister City Initiative & Managing Director, Deutsche Bank (Private Wealth Management)
9. Malav Shroff, Co-founder and Chief Executive Officer, Ocean Blue
10. Nayan Raheja, Director, Raheja Developers
11. Peter Drummond, Chief Executive, BDP
12. Satish Magar, Chairman and Managing Director of Magarpatta Township Development & Construction Company Limited
13. Tobias Engelmeier, Founder, Bridge-To-India
14. Yashpal Sachdev, Transport Consultant, RITES Pvt Ltd

NGOs / civil society organisations / media

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2. Jehangir Pocha, Editor-in-Chief, BusinessWorld Magazine
3. Joey Tabone, Senior Advisor for Climate Change, The Prince's Foundation for the Built Environment
4. K Yatish Rajawat, Editor-in-Chief, Business Bhaskar
5. Leena Srivastava, Executive Director, The Energy and Resource Institute
6. Manisha Malhotra, Administrator, Mittal Champions Trust
7. Prathibha Prahlad, Festival Director, Delhi International Arts Festival
8. Ratish Nanda, Project Director, Aga Khan Trust for Culture
9. Ravi Singh, Secretary General, WWF – India
10. Romi Chopra, President, Resident Welfare Association, Vasant Vihar
11. SK Sinha, Executive Director, Toxics Link
12. Sekhar Raghawan, Director, Rain Centre Chennai

inputs from conferences

Urban Mobility Conference, Institute of Urban Transport and Ministry of Urban Development, New Delhi; 3rd December 2008:

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